2007
AMENDMENTS
to the
Program of Studies: Senior High Schools

1. **Replace** (2006) front-end pages i to vi and Preamble pages 1 to 5 with **revised** (2007) front-end pages i to vii and Preamble pages 1 to 4.

2. ABORIGINAL LANGUAGE AND CULTURE PROGRAMS
   - **Replace** the Aboriginal Language and Culture Programs title page, following the Aboriginal Language and Culture Programs divider.
   - **Insert new** Cree Language and Culture 10-3Y, 20-3Y, 30-3Y (Three-year Program), pages 1 to 44, following Blackfoot Language and Culture 10–20–30, page 16.
   - **Insert new** Cree Language and Culture 10-6Y, 20-6Y, 30-6Y (Six-year Program), pages 1 to 42, following Cree Language and Culture 10-3Y, 20-3Y, 30-3Y, page 44.

3. GREEN CERTIFICATE PROGRAM
   - **Replace** Green Certificate Program title page, following the Green Certificate Program divider.
   - **Replace** Green Certificate Program (2000), pages 1 to 10, with **revised** Green Certificate Program (Revised 2006), pages 1 to 10, following the Green Certificate Program title page.
   - **Insert new** Bee Keeper Production Technician, pages 11 to 13, following Green Certificate Program (Revised 2006), page 10.

4. INTEGRATED OCCUPATIONAL PROGRAM
   - **Replace** the Integrated Occupational Program title page, following the Integrated Occupational Program divider.
   - **Remove** IOP Social Studies 16, pages 12 to 18 (1992) with **revised** Social Studies 16–26, page 12 (Revised 2007).

5. KNOWLEDGE AND EMPLOYABILITY
   - **Replace** the Knowledge and Employability title page, following the Knowledge and Employability divider.
   - **Insert new** KE Social Studies 10-4, 20-4, pages 1 to 38, following KE Science 20-4, page 37.
   - **Insert new** KE Fabrics, pages 13 to 76, following KE (Cosmetology) Esthetics 30-4, page 79.
   - **Insert new** KE Natural Resources, pages 13 to 98, following KE (Human Care) Home Care 30-4, page 77.

(continued)

6. SCIENCE

- **Replace** the Science title page, following the Science divider.
- **Insert new** Biology 20–30 (2007), pages 1 to 85, following Science 10, page 34.
- **Remove** Biology 20 (1998), pages 11 to 40, and **replace** with **revised** Biology 20, page 11 (Revised 2007).
- **Insert new** Chemistry 20–30 (2007), pages 1 to 73, following Biology 30 (1998), page 69.
- **Remove** Chemistry 20 (1998), pages 11 to 34, and **replace** with **revised** Chemistry 20, page 11 (Revised 2007).
- **Insert new** Physics 20–30 (2007), pages 1 to 71, following Chemistry 30 (1998), page 51.
- **Remove** Physics 20 (1998), pages 11 to 36, and **replace** with **revised** Physics 20, page 11 (Revised 2007).
- **Remove** Science 20–30 (Revised 2006), page 1, and Science 20 (2006), pages 1 to 53, and **replace** with **new** Science 20–30, pages 1 to 92.

7. SECOND LANGUAGES

- **Replace** the Second Languages title page, following the Second Languages divider.
- **Remove** German Language and Culture 10–20–30, pages 1 to 37, and **replace** with **renamed** German Language and Culture 10-3Y, 20-3Y, 30-3Y, pages 1 to 36.
- **Remove** German Language and Culture 10S–20S–30S, pages 1 to 37, and **replace** with **renamed** German Language and Culture 10-6Y, 20-6Y, 30-6Y, pages 1 to 36.
- **Remove** Italian Language and Culture 10–20–30, pages 1 to 37, and **replace** with **renamed** Italian Language and Culture 10-3Y, 20-3Y, 30-3Y, pages 1 to 36.
- **Remove** Italian Language and Culture 10S–20S–30S, pages 1 to 37, and **replace** with **renamed** Italian Language and Culture 10-6Y, 20-6Y, 30-6Y, pages 1 to 36.
- **Remove** Spanish Language and Culture 10–20–30, pages 1 to 39, and **replace** with **renamed** Spanish Language and Culture 10-3Y, 20-3Y, 30-3Y, pages 1 to 40.
- **Remove** Spanish Language and Culture 10S–20S–30S, pages 1 to 37, and **replace** with **renamed** Spanish Language and Culture 10-6Y, 20-6Y, 30-6Y, pages 1 to 36.

8. SOCIAL STUDIES

- **Replace** the Social Studies title page, following the Social Studies divider.
- **Insert new** Social Studies, page 1, following the Social Studies title page.
- **Insert new** Program Rationale and Philosophy (2005), pages 1 to 12, following Social Studies, page 1.
- **Insert new** Social Studies 10-1 and 10-2, pages 13 to 38, following Program Rationale and Philosophy, page 12.
- **Remove** Social Studies 10 (Revised 2000), pages 9 to 24, and **replace** with **revised** Social Studies 10, page 9 (Revised 2007).
- **Remove** Social Studies 13 (Revised 2000), pages 9 to 24, and **replace** with **revised** Social Studies 13, page 9 (Revised 2007).

PROGRAM *of* STUDIES

Senior High Schools

This Program of Studies is issued under the authority of the Minister of Education pursuant to section 39(1) of the *School Act*, Revised Statutes of Alberta 2000, Chapter S–3 with amendments in force as of January 1, 2002.

Alberta
EDUCATION

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This document reflects changes in the program of studies for senior high schools up to August 2007.

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PROGRAM OF STUDIES: SENIOR HIGH SCHOOLS

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❶ Program information only.

Course **All programs of study are available for viewing and downloading at <http://www.education.gov.ab.ca> under Kindergarten to Grade 12, Curriculum and Learning and Teaching Resources, Programs of Study and Learning and Teaching Resources.**	A. Program Rationale and Philosophy	B. General Learner Expectations	C. Curriculum Standards/ Specific Learner Expectations
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Course **All programs of study are available for viewing and downloading at <http://www.education.gov.ab.ca> under Kindergarten to Grade 12, Curriculum and Learning and Teaching Resources, Programs of Study and Learning and Teaching Resources.**	A. Program Rationale and Philosophy	B. General Learner Expectations	C. Curriculum Standards/ Specific Learner Expectations
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[1] Program information only.

INTRODUCTION

Program of Studies

The *Program of Studies* identifies the outcomes for the core and optional learning components for Kindergarten to Grade 12. Content is focused on what students are expected to know and be able to do.

Though organized into separate subject, course or program areas, there are many connections across the curriculum. Students see the world as a connected whole rather than as isolated segments. Integrating across content areas, and providing ways for students to make connections, enhances student learning. The reporting of student progress should, nevertheless, be in terms of the outcomes outlined in courses of study for each subject area.

Within any group of students there is a range of individual differences. Flexibility in planning for individuals within a group is needed. Therefore, school organization and teacher methodology are not mandated at the provincial level and may vary from class to class and school to school in order to meet student needs.

For guidelines and regulations relating to school programs and organization for instruction, refer to the *Guide to Education: ECS to Grade 12*, available for viewing and downloading from the Alberta Education Web site. Print copies are available for purchase from the LRC.

Basic Learning Resources

Alberta Education authorizes a variety of resources to support the programs of study. Complete listings of all resources can be found in the *Learning Resources Centre Resources Catalogue*, or electronically through the:

- LRC Web site at www.lrc.education.gov.ab.ca.

Resource listings can also be accessed through the:

- Authorized Resources Database at www.education.gov.ab.ca under Kindergarten to Grade 12, Curriculum and Learning and Teaching Resources, Programs of Study and Learning and Teaching Resources.

Alberta Education Web Site

Information covering all areas of Kindergarten to Grade 12 education in Alberta, including curriculum and resources, can be found at www.education.gov.ab.ca under Kindergarten to Grade 12.

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PROGRAM FOUNDATIONS

Alberta's Education System[1]

Vision

The best Kindergarten to Grade 12 education system in the world.

Mission

The Ministry of Education, through its leadership and work with stakeholders, ensures that students attain the knowledge and skills required for lifelong learning, work and citizenship.

Values

- Respect
- Accountability
- Integrity
- Excellence

Principles

Student Centred

- The highest priority of the education system is the success of the student.

Accessible

- Every student in Alberta has the right of access to a quality basic education consistent with the student's needs and abilities.

Collaborative

- Kindergarten to Grade 12 education, which provides the foundation for lifelong learning, best occurs when partners and stakeholders work together to provide a holistic approach and a supportive environment.

Accountable

- All those involved in the education system are accountable to Albertans for quality results, system sustainability and fiscal responsibility.

Responsive

- The education system is flexible, anticipates student needs and provides opportunities for parent and student choice.

Innovative

- The education system demonstrates leading-edge innovation for improved results.

Equitable

- All students have equitable access to quality learning opportunities.

Core Business: Lead and Support the Kindergarten to Grade 12 Education System So That All Students Are Successful at Learning

Goal 1 – High quality learning opportunities for all

Goal 2 – Excellence in student learning outcomes

Goal 3 – Highly responsive and responsible education system

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[1] Excerpted from the *Education Business Plan 2007–2010*, April 2007. This plan is available on the Alberta Education Web site at www.education.gov.ab.ca.

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Goals and Standards Applicable to the Provision of Basic Education in Alberta[1]

A basic education must provide students with a solid core program, including language arts, mathematics, science and social studies.

Students will be able to meet the provincial graduation requirements and be prepared for entry into the workplace or post-secondary studies. Students will understand personal and community values and the rights and responsibilities of citizenship. Students will develop the capacity to pursue learning throughout their lives. Students also should have opportunities to learn languages other than English and to attain levels of proficiency and cultural awareness which will help to prepare them for participation in the global economy.

Student Learning Outcomes

Students are expected to develop the knowledge, skills and attitudes that will prepare them for life after high school. A basic education will allow students to:

- read for information, understanding and enjoyment
- write and speak clearly, accurately and appropriately for the context
- use mathematics to solve problems in business, science and daily-life situations
- understand the physical world, ecology and the diversity of life
- understand the scientific method, the nature of science and technology, and their application to daily life
- know the history and geography of Canada and have a general understanding of world history and geography
- understand Canada's political, social and economic systems within a global context
- respect the cultural diversity and common values of Canada
- demonstrate desirable personal characteristics, such as respect, responsibility, fairness, honesty, caring, loyalty and commitment to democratic ideals
- recognize the importance of personal well-being, and appreciate how family and others contribute to that well-being
- know the basic requirements of an active, healthful lifestyle
- understand and appreciate literature, the arts and the creative process
- research an issue thoroughly, and evaluate the credibility and reliability of information sources
- demonstrate critical and creative thinking skills in problem solving and decision making
- demonstrate competence in using information technologies
- know how to work independently and as part of a team
- manage time and other resources needed to complete a task
- demonstrate initiative, leadership, flexibility and persistence
- evaluate their own endeavours and continually strive to improve
- have the desire and realize the need for lifelong learning.

Standards for Student Learning

The Minister of Education defines acceptable standards and standards of excellence for student achievement in consultation with Albertans. Employers are involved in specifying the knowledge, skills and attitudes needed in the workplace. Schools, school authorities and the Minister of Education assess and report regularly to the public on a range of student learning.

The school's primary responsibility is to ensure that students meet or exceed the provincial standards, as reflected in the Student Learning Outcomes (outlined above), the Alberta Programs of Study, provincial achievement tests, diploma examinations and graduation requirements.

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[1] Excerpted from the *K–12 Learning System Policy, Regulations and Forms Manual.* This manual is available on the Alberta Education Web site at www.education.gov.ab.ca.

Education Delivery

Schools must engage students in a variety of activities that enable them to acquire the expected learnings. Schools have authority to deploy resources and may use any instructional technique acceptable to the community as long as the standards are achieved. Schools, teachers and students are encouraged to take advantage of various delivery options, including the use of technology, distance learning and the workplace.

Schools play a supportive role to families and the community in helping students develop desirable personal characteristics and the ability to make ethical decisions. Schools also help students take increasing responsibility for their learning and behaviour, develop a sense of community belonging and acquire a clearer understanding of community values and how these relate to personal values.

Students learn basic, transferable knowledge, skills and attitudes in school. Schools, in co-operation with employers, provide opportunities for students to develop and practise employability skills. The Minister of Education provides credit for off-campus learning that is approved and accepted by the school and the employer. Government works with schools, employers and post-secondary institutions to help young people make a smooth transition to work and further study.

RELIGIOUS AND PATRIOTIC INSTRUCTION

The following section of the *School Act* focuses on religious and patriotic instruction. It is cited here for the information of administrators and teachers.

SECTION 50(1) A board may

(a) prescribe religious instruction to be offered to its students;

(b) prescribe religious exercises for its students;

(c) prescribe patriotic instruction to be offered to its students;

(d) prescribe patriotic exercises for its students;

(e) permit persons other than teachers to provide religious instruction to its students.

(2) Where a teacher or other person providing religious or patriotic instruction receives a written request signed by a parent of a student that the student be excluded from religious or patriotic instruction or exercises, or both, the teacher or other person shall permit the student

(a) to leave the classroom or place where the instruction or exercises are taking place for the duration of the instruction or exercises, or

(b) to remain in the classroom or place without taking part in the instruction or exercises.

1988 cS–3.1 s33;1990 c36 s16

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ABORIGINAL LANGUAGE AND CULTURE PROGRAMS

CONTENTS

Blackfoot Language and Culture 10–20–30

Cree Language and Culture 10-3Y, 20-3Y, 30-3Y Program (Three-year Program)

Cree Language and Culture 10-6Y, 20-6Y, 30-6Y Program (Six-year Program)

Cree Language and Culture Kindergarten to Grade 12 (Twelve-year Program)

CREE LANGUAGE AND CULTURE 10-3Y, 20-3Y, 30-3Y

This Cree Language and Culture Three-year (3Y) Program is intended for students who are beginning their study of Cree language and culture in senior high school.

PHILOSOPHY

"Our way is a valid way of seeing the world."
– Western Canadian Protocol Aboriginal Languages Working Group

"Our tepees were round like the nests of birds … the nations hoop, a nest of many nests where the Great Spirit meant for us to hatch our children."
– Black Elk, Oglala Sioux Holy Man

ELDER AND COMMITTEE ADVISORS

The contents of this program of studies are drawn from the wisdom and ideas of countless Elders—past and present—Cree educators whose words enlighten and challenge both in person and in writing, and who are struggling with issues of language loss and language revitalization. In particular, the Cree Language and Culture 10-3Y, 20-3Y, 30-3Y Development Committee wishes to acknowledge the following Elders who advised some of the developmental stages of this document:

- Alfred Bonaise
- Jenny Cardinal
- Joe P. Cardinal
- Linda Oldpan
- Jerry Saddleback

The following individuals were also involved, in various capacities, in the development of this program of studies:

- Janice Aubry
- Loretta Breland
- Mary Cardinal-Collins
- Wayne Jackson
- Gena Kolay
- Donna Leask
- Jutta McAdam
- Tony Petrone
- Joan Simpson
- John Sokolowski
- Marion Stone
- Stuart Wachowicz

VOICES OF THE ELDERS

The wisdom of the Elders is central to cultural learning according to Cree perspective. Elders are the "keepers of knowledge," and it is their guidance that Cree people seek as they strive for balance in their relationships with *Omâmawi Ohtâwîmâw* (the Creator), the natural world, other people and themselves.

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The quotations in this section are intended to illustrate the vast wisdom of Aboriginal Elders as "keepers of knowledge" and as educators within a traditional system of learning. The Elders' comments are excerpted directly from *The Common Curriculum Framework for Aboriginal Language and Culture Programs, Kindergarten to Grade 12,* June 2000; and they reflect a wide variety of oral and written sources. Alberta Education acknowledges the necessity of guidance from the Elders if this program is truly to reflect Aboriginal perspective. Each community wishing to establish a language and culture program must turn to its own Elders for guidance. It is only with Elder support that Aboriginal language and culture programs can succeed in achieving the goal of language revitalization.

Aboriginal Education

Aboriginal educators and Elders have envisioned an education for their children that strengthens and inspires by focusing on traditional wisdom. They have envisioned an education where the young people of today are helped in creating a peaceful balance within themselves, using Aboriginal "laws" as a guide. The "laws" that govern life are not laws in the literal and mechanistic sense. They are perspectives that can help young people to orient themselves positively as Aboriginal people while establishing or strengthening their personal identities. They are perspectives that enable Aboriginal people to live with integrity, regardless of the environment or circumstances in which they find themselves.

Most importantly for Aboriginal educators, these perspectives are supported with an abundance of time-tested learning resources in the form of oral traditions. Stories from the oral tradition have been used in formal classrooms in the past. They are recognized as valuable and integral learning resources, and they become more valuable as the perspectives they communicate are understood, recognized and accepted as legitimate.

The various forms, such as legends and stories, need to be understood as culturally significant and authentic. As an example, legends (*âtayohkewina*) are formalized in much the same way as essay writing is. There is a protocol for obtaining legends or stories from storytellers. In addition, there are various styles of stories, such as miraculous, humorous or historical.

Here, in their words, are Aboriginal voices that speak clearly and persuasively about the need for, and the right to, language and culture programs based on Aboriginal perspectives.

Perspectives-based Culture and Language Education

The Aboriginal perspective is as useful today as it was in the past in helping people live with integrity, especially as people relocate into urban areas or away from kin.

"We came from a system of laws and relationships. The laws were the parameters of acceptable behaviour within each relationship. Our lifestyles have changed a lot but the necessity to survive with integrity is still with me. We must elevate our discussion in a way that we can identify the principles."

– Wes Fineday, Regina, Saskatchewan

"Business cannot be separated from the environment. The environment cannot be separated from government. Government cannot be separated from social and economic issues. People cannot be separated from all of the above. Perhaps it is time to recognize this and make efforts to reinstate a whole-life perspective in education."

– Patrick Kelly, Sto:lo Nation (1991, p. 145)

The Aboriginal perspective will guide young people in making choices that will prepare them for their future as capable adults; it will help them in understanding the value or purpose of things, or in making personal decisions; and it will help them to be empowered.

Language and culture are inseparable. Both are necessary to instill identity in its fullest sense.

"Language ... is not just a neutral instrument [for communication]. Rather, it shapes our very conceptualization of phenomena, such that some phenomena are not translatable into another language and some languages have no words for certain phenomena found in other cultures.... We Aboriginal people are forced to speak the foreign language of the

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English to convey a lot of our spirituality, our thought, our essence. Unfortunately, it is not adequate to the task. So, if people want to understand us and the things in which we take pride, they should learn our respective languages. I am proud of my Cree language and heritage."

– George Calliou, Cree, Sucker Creek, Alberta

Aboriginal Rights

There is a need and an inherent right to maintain the Aboriginal languages and cultures.

"Our kids are losing their identity. They don't know their history. My grandparents taught me the dangers, what to respect, etc. They told me to never forget where I came from. When our kids come out of school, who are they? Who do they belong to?"

– Roddy Blackjack, Little Salmon/Carmacks, Yukon Territory

Young people represent the future of our culture.

"We know that the world will be a much different place when our children become adults and take responsibility for our community. We must now decide what we want our children to know and what traditions to carry from our ancestors."

– Peigan Education Committee

The Aboriginal children will benefit from being taught the language and culture of their people.

"Indian parents have the right to directly influence the education of their children. This right, which was guaranteed through treaties, should never become a privilege."

– Alexis First Nation

Local Control

Past efforts have not been sufficient in stabilizing or revitalizing the Aboriginal languages and cultures.

"We now have a litany of what we have viewed as the one item that will save our languages. This one item is usually quickly replaced by another. For instance, some of us said, 'Let's get our languages into written form' and we did and still our Native American languages kept on dying.... Then we said, 'Let's develop culturally relevant materials' and we did and still our languages kept on dying. Then we said, 'Let's use language masters to teach our languages' and we did, and still our languages kept on dying.... 'Let's put our native language speakers on CD–ROM' .... Finally, someone will say, 'let's flash-freeze the remaining speakers of our languages' ...."

– Richard E. Littlebear (Cantoni, 1996, pp. xiii–xiv)

"In 1960 we started out by organizing ourselves to bring back our dances and songs. The young people are so willing to learn our ways. But I can't be out too much anymore. We are tired."

– Mary John, Prince George, British Columbia

"Some of those who are intent on learning the language feel frustrated at the lack of opportunity to use it, and find that they are not able to progress past a certain point without the chance for more language immersion experiences."

– Jan Hill, Mohawk (Freeman et al., 1995, p. 62)

Communities and schools must work together to strengthen the languages and cultures of the Aboriginal nations.

"To reverse this influence of English, families must retrieve their rightful position as the first teachers of our languages. They must talk our languages everyday, everywhere, with everyone, anywhere. But if they are going to relinquish this teaching responsibility to the schools then they must be supportive."

– Richard E. Littlebear (Cantoni, 1996, p. xiv)

Local communities are the ones to create and develop language and culture programs to suit their particular needs; e.g., language awareness packages designed for home use, promoting languages through the various media and encouraging fluent speakers in the service industry to use their Aboriginal language while interacting with their clientele.

"... the Aboriginal community must be the central decision maker in any initiative on Aboriginal language maintenance ... [and also] the support of the majority culture, and particularly policy makers, is essential in making Aboriginal language policies work."

– Barbara Burnaby (1996, p. 33)

"Over and over, people who have come to our communities to get information, go away and write up and interpret and when we see it, we don't recognize it. Which person? Which family? Which village was involved in developing the materials? We prefer our own way of learning."

– Mary John, Prince George, British Columbia

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Colonization and Reconstruction

From the perspective of the Aboriginal people, the post-contact period is characterized as a time of great dislocation. Colonizing forces disrupted the fundamental relationships of Aboriginal people and disrupted their way of being in the world.

In the early contact period, the relationship between the European and Aboriginal populations was one of mutual respect. For example, the treaties were signed by two nations. The spirit and intent of the treaties as understood by the Aboriginal people was that language and culture would be respected.

However, the forces of contact caused great disharmony and dislocation by enforcing the *Indian Act* of 1876 and the subsequent amendments. One of the most detrimental policies stemming from the *Indian Act* was the prohibition of ceremonial practices, thus limiting language and cultural transmission. The ensuing effects almost destroyed Aboriginal values and cultural identity, and served as a catalyst to the erosion of Aboriginal languages.

Despite the effects of colonialism, the perspectives and values of Aboriginal people are maintained.

"My grandmother was a boarding school product and on my mother's side, my father went to the same boarding school that I went to.... Like it seems that we lost about three generations of teachings but it was easy for us to go back to our teachings."

– Maria Linklator, Cree, Thunderchild First Nation (Saskatchewan Indian Cultural Centre, http://www.sicc.sk.ca/cgi-bin/sicc/epage.pl?162)

Aboriginal people work to maintain their identity as nations within Canada.

"Our culture is very important to us. I believe that if we lose our language, our dances, our music, our tales handed down from generation to generation by our elders, we lose what our country is to us.... We must keep our language, our culture, and our land so that, even in Canada, we can still feel that we have our own country."

– Mary John (Moran, 1988, pp. 141–142)

The mainstream culture has begun to explore, appreciate and apply Aboriginal perspectives for their inherent value.

"In labelling children as 'gifted' or 'not gifted,' rather than calling attention to their specific abilities, ... we begin thinking that children are naturally clustered into two well-defined groups, 'gifted' and 'non-gifted.' ...

"Cultural teachers in First Nations communities ... place a great deal of emphasis on spirituality—not to be confused with forms of organized religion! These teachers stress that each individual human has been designed by the Creator, and each of us has a specific purpose to fulfill on earth."

– John W. Friesen (1997, pp. 27–28)

Spirituality

Although the Elders strongly recommend that the connection to *Omâmawi Ohtâwîmâw* (the Creator) be interwoven throughout the program of studies, the developers and Elders themselves respect that individuals/teachers may not want to teach/promote this view. Above all, one's individual integrity is respected. Walter Linklator expressed this view when he said, "... we never force anybody because we are not supposed to do that. We just share and if that person wants to learn more then that person just keeps coming back to Elders to find out the importance of spiritual identity" (Saskatchewan Indian Cultural Centre, http://www.sicc.sk.ca/cgi-bin/sicc/epage.pl?161).

Laws of Relationship

"We use the circle as a means of teaching. It's not a straight line type of teaching that we use. With us, everything is connected and interconnected ..."

– Parent council member, Joe Duquette High School, Saskatoon, Saskatchewan (Haig-Brown et al., 1997, p. 96)

Our Relationship with the Natural World

People are not greater than the things in nature. The natural world has its own laws that must be respected if people are going to be sustained by it. People are identified by the land they have historically inhabited and on which they have learned to survive.

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Even today, it is necessary to live with the laws of nature and to feel a part of it.

"The time the Whiteman first came to this country, he saw there was a lot of land.... It was a beautiful land, a land that was here in order for us to make our living from it. This land provided us with things, gave us a good life and we were able to survive by all the resources available to us.... The Creator had placed them on the land for our use, and though they were taken, continues to protect us, which is why we were never completely destroyed and why we are still here today. If the Whiteman had a better understanding of what the land meant to us, he would have thought differently about us."

– John B. Tootoosis, Deceased, Poundmaker First Nation (Saskatchewan Indian Cultural Centre, http://www.sicc.sk.ca/cgi-bin/sicc/epage.pl?1)

Our Relationship with One Another

Agreement on rules enables cooperation and group strength, which is greater than individual strength.

Identity comes from being in respectful relationships with others, particularly in the family/clan, community and nation.

"Some of our family members are living in urban areas. That's no excuse. Families can still keep in touch and they need to.... The responsibility for anyone with any problem lies with the family 'cause this is the way our people were historically, 'cause that's where the basic help was all the time, whatever you dealt with. If a problem went beyond the control of the family, then it expanded to the larger family, you know, discussions of that. Failing that, then there were advisory groups responsible to the Chief who those problems could be placed under and dealt with."

– Roy Haiyupis, Ahousaht (Nuu-chah-nulth, 1995, p. 172)

Our Relationship with Ourselves

Each person is born sacred and complete.

"We must redefine and redevelop our profile of what our child is: He is not something to develop the economy. He is a spirit."

– Wes Fineday, Regina, Saskatchewan

Omâmawi Ohtâwîmâw (the Creator) has given each person the gift of a body and the choice to care for and use that body with respect.

Omâmawi Ohtâwîmâw (the Creator) has given each person the capacity and choice to learn.

"I had no schooling. When I was a kid, I used to watch people steadily. I would go to my Grandmother and she told me what rules to follow."

– Vernon Makokis, Saddle Lake, Alberta

"We never force anybody because we are not supposed to do that. We just share and if that person wants to learn more then that person just keeps coming back to Elders to find out the importance of spiritual identity. We have to try to be good all the time."

– Walter Linklator, Anishanabe, Thunderchild First Nation (Saskatchewan Indian Cultural Centre, http://www.sicc.sk.ca/cgi-bin/sicc/epage.pl?161)

"In our system of education, knowledge is earned. One learns to listen, like a human being who has the gift to hear what is said. We don't put knowledge in a person's head or hand. We give directions, not answers. We don't trap people into thinking answers are given from the outside. Answers come from the inside."

– Wes Fineday, Regina, Saskatchewan

"Here are some things for young people to use. Do what an Elder tells you and at the same time, develop your own understanding and follow that."

– Maggie Okanee, Born 1876, Deceased, Cree, Turtle Lake First Nation (Saskatchewan Indian Cultural Centre, http://www.sicc.sk.ca/cgi-bin/sicc/epage.pl?93)

Omâmawi Ohtâwîmâw (the Creator) has given each person talents or strengths to be discovered and the choice to develop and share the gifts.

"The people had carefully organized themselves according to their knowledge, wisdom and abilities.... The men had many abilities; some were canoe builders, carpenters, and weather predictors. Often each man possessed several abilities, which old people call 'gifts.'"

– Andrew Evans, Norway House, Manitoba (Apetagon, Vol. II, 1992, p. 8)

RATIONALE FOR LEARNING CREE (*NEHIYAWEWIN*)

Elders say that English is a "borrowed" language (*eh awîkawîyahk*), while Cree (*Nehiyawewin ekîmiy'kôwisiyahk*) is a gift of *Omâmawi Ohtâwîmâw* (the Creator). Elders are the keepers

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of the language and, consequently, of the beliefs and culture. Indeed, language and culture are inextricably woven.

The importance of learning Cree was made clear when the developers of this curriculum met with Elders Joe P. Cardinal, Jenny Cardinal, Linda Oldpan, Alfred Bonaise and Jerry Saddleback. Alfred Bonaise referred to the development of this curriculum as an example of keeping the "flame of language" alive. That flame, the Elders believe, has to be nurtured into a fire of language learning for students. Linda Oldpan, Joe Cardinal and Jenny Cardinal stressed that although this curriculum reflects an "urban perspective," the students need to somehow connect with *Kikâwînaw Askiy* (Mother Earth) and with their lands and families of origin. All of the Elders expressed the need for this curriculum to reflect the connection to *Omâmawi Ohtâwîmâw* (the Creator).

The importance of Cree language learning has also been expressed by Dr. Anne Anderson, who states in the forewords to her Métis Cree resource books that the way to a people's heart is through their language.

Over 80 000 people in Canada speak Cree. It is one of the most widely spoken languages in Canada in various dialects. There are also reservations in the United States of America that have Cree-speaking populations.

The value of learning Cree (*Nehiyawewin*), to Aboriginal and non-Aboriginal students, is enormous. It permits insights into a worldview of spiritual and natural dimensions. When one speaks the language, Elders and their wisdom become accessible. The learning of the Cree language also enhances one's self-esteem by strengthening cultural identity. Use of language is also the best means of transmitting culture to the next generation.

"With the loss of our language, we lose everything.... We must keep our language. With it come the teachings of the old ones and it's the only thing that will preserve what is truly Indian.... Our future as a people doesn't look too good.... Tell the young people they must learn and keep their language...."

– Maggie Francheater, Sunchild Band (Alberta Education, 1990, p. vii)

NATURE OF THE CREE LANGUAGE

The Cree language, or *Nehiyawewin*, is one of many indigenous languages within the Algonkian family of languages. The Cree "Y" dialect that is used in this program of studies is one of the five major dialects in Canada. Cree is a language of relationships—relationships to *Omâmawi Ohtâwîmâw* (the Creator), to others (kinship) and to *Kikâwînaw Askiy* (Mother Earth), which encompasses all living things. It is a rich and complex language because it relates to kinship, nature and spirituality.

The Roman orthography recommended for the instruction of Cree is the Pentland orthography, which is based on the Cree syllabics of standard orthography. The "Y" dialects of the Plains and Woodland Cree of Alberta use 14 English letters, of which 8 are consonants (c, k, m, n, p, s, t and h), 3 are short vowels (a, i, o), 4 are long vowels (a, i, o, e), and "w" and "y" are listed as semi-vowels. A sound variation occurs within the same dialect based on regional and cultural differences.

CONCEPTUAL MODEL

Two curriculum frameworks developed under the Western Canadian Protocol for Collaboration in Basic Education—*The Common Curriculum Framework for Aboriginal Language and Culture Programs, Kindergarten to Grade 12*, June 2000, and *The Common Curriculum Framework for International Languages, Kindergarten to Grade 12*, June 2000—have provided guidance in the development of the Cree Language and Culture 10-3Y, 20-3Y, 30-3Y Program of Studies.

The aim of this Cree language and culture program of studies is the development of communicative competence and cultural knowledge, skills and values in Cree. It is important that the focus of this program of studies be on interaction and meaningfulness, with special attention and emphasis being given to oral communication.

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Four Components

For the purposes of this program of studies, communicative competence and the development of cultural knowledge, skills and values in Cree are represented by four interrelated and interdependent components.

Applications deal with what the students will be able to do with the language, the functions they will be able to perform and the contexts in which they will be able to operate.

Language Competence addresses the students' knowledge of the language and their ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used.

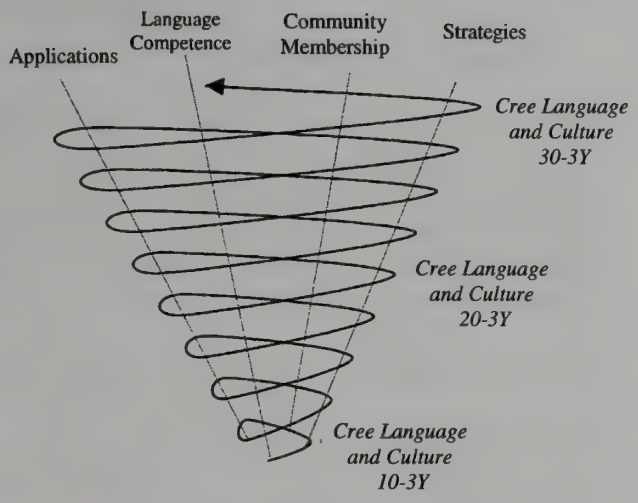
Community Membership aims to develop the understandings, views and values of Cree culture.

Strategies help students learn and communicate more effectively and more proficiently.

Each of these components is described more fully at the beginning of the corresponding section of this program of studies.

A Spiral Progression

Language learning and cultural teachings are integrative, not merely cumulative. Each new element that is added must be integrated into the whole of what has gone before. The model that best represents the students' language and cultural learning progress is an expanding spiral. Students' progression is not only vertical (e.g., increased proficiency), but also horizontal (e.g., broader range of applications and experience with more text forms, contexts and so on). The spiral also represents how language and cultural learning activities are best structured. Particular lexical fields, learning strategies or language functions are revisited at different points in the program, but from a different perspective, in broader contexts or at a slightly higher level of proficiency each time. Learning is reinforced, extended and broadened with each successive pass.



ORGANIZATION OF THE PROGRAM OF STUDIES

General Outcomes

General outcomes are broad statements identifying the knowledge, skills and attitudes that students are expected to achieve in the course of their language learning experience. Four general outcomes serve as the foundation for this program of studies and are based on the conceptual model outlined previously.

Applications [A]

- Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

Language Competence [LC]

- Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

Community Membership [CM]

- Students will live (*wa)wetina(hk)* (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

★ discretionary (see further details on p. 30)

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Strategies [S]

- Students will use strategies to maximize learning and communication.

The order in which the general outcomes are presented in this program of studies does not represent a sequential order, nor does it indicate the relative importance of each component. The general outcomes are to be implemented in an integrated manner.

Specific Outcomes

Each general outcome is further broken down into specific outcomes that students are to achieve by the end of each course. The specific outcomes are interrelated and interdependent. In most classroom activities, a number of learning outcomes are addressed in an integrated manner.

The specific outcomes are categorized under cluster headings, which show the scope of each of the four general outcomes. These headings are shown in the table on the following page.

The specific outcomes are further categorized by strands, which show the developmental flow of learning from the beginning to the end of the program. However, a learning outcome for a particular course will not be dealt with only in that particular year of the program. The spiral progression that is part of the conceptual model means that activities in the years preceding will prepare the ground for acquisition and in the years following will broaden applications.

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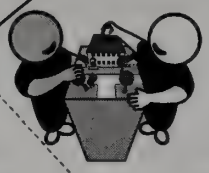
General Outcomes

Applications

Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

A–1 to share information
A–2 to express emotions and personal perspectives
A–3 to get things done
A–4 to enhance their knowledge of the world
A–5 for imaginative purposes and personal enjoyment
A–6 to form, maintain and change interpersonal relationships



Strategies

Students will use strategies to maximize learning and communication.

S–1 language learning
S–2 language use
S–3 cultural learning
S–4 general learning

Language Competence

Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–1 attend to the form of the language
LC–2 interpret and produce oral texts
LC–3 interpret and produce written and visual texts
LC–4 apply knowledge of the sociocultural context
LC–5 apply knowledge of how the language is organized, structured and sequenced

Community Membership

Students will live (*wa)wetina(hk)* (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

CM–1 *Kikâwînaw Askiy* (Mother Earth★)
CM–2 others
CM–3 themselves

★ discretionary (see further details on p. 30)

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Guide to Reading the Program of Studies

General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers.
(*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

cluster heading for specific outcomes

LC–2 interpret and produce oral texts

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
LC–2.1 listening	a. understand a series of simple spoken sentences in guided situations	a. understand short, simple oral texts on familiar topics in guided situations	a. understand short, simple oral texts in guided and unguided situations
LC–2.2 speaking	a. produce words, phrases and simple sentences, orally, in guided situations	a. produce short, simple oral texts in guided situations	a. produce short oral texts on familiar topics in guided and unguided situations
LC–2.3 interactive fluency	a. engage in simple interactions, using short, simple words and phrases	a. engage in simple interactions, using simple sentences	a. manage short interactions with ease, with pauses to formulate oral text, and self-correct

read each page vertically for the outcomes expected at the end of each course

strand headings for specific outcomes

specific outcome statements for each course

read each page horizontally for the developmental flow of outcomes from course to course

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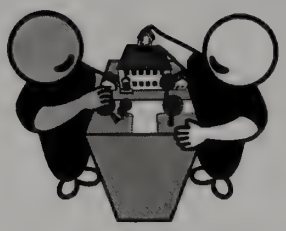

Applications

to express emotions
and personal perspectives

to share
information

to get things done

Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

to form, maintain and
change interpersonal
relationships

for imaginative purposes
and personal enjoyment

to enhance their
knowledge of the world

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APPLICATIONS

The specific outcomes under the heading Applications deal with **what** the students will be able to do with the language; that is, the **functions** they will be able to perform and the **contexts** in which they will be able to operate.

The functions are grouped under six cluster headings—see the illustration on the preceding page. Under each of these headings there are one or more strands that show the developmental flow of learning from course to course. Each strand, identified by a strand heading at the left end of a row, deals with a specific language function; e.g., share factual information. Students at any grade level will be able to share factual information. Beginning learners will do this in very simple ways. As students gain more knowledge and experience, they will broaden the range of subjects they can deal with, they will learn to share information in writing as well as orally, and they will be able to handle formal and informal situations.

The level of linguistic, sociolinguistic and discourse competence that students will exhibit when carrying out the functions is defined in the specific outcomes for Language Competence for each course. To know how well students will be able to perform the specific function, the Applications outcomes must be read in conjunction with the Language Competence outcomes.

It is important that the focus of the Applications component be on interaction and meaningfulness, with special attention and emphasis being given to oral communication.

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General Outcome for Applications
Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

A–1 to share information

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
A–1.1 share factual information	a. identify concrete people, places and things b. ask for and provide basic information c. respond to simple, predictable questions	a. ask for and provide information on a range of familiar topics b. describe people, places, things and series or sequences of events or actions	a. provide information on several aspects of a topic; e.g., give a simple report b. understand and use comparisons and examples

A–2 to express emotions and personal perspectives

Students will be able to:

A–2.1 share ideas, thoughts, preferences	a. express a personal response and simple preferences b. identify special people, places or things	a. express a personal response to a variety of situations b. inquire about and express likes and dislikes c. record and share thoughts and ideas with others	a. inquire about and express agreement and disagreement, approval and disapproval, interest and lack of interest, and satisfaction and dissatisfaction
A–2.2 share emotions, feelings	a. respond to and express emotions and feelings b. identify emotions and feelings	a. inquire about, express and respond to a variety of emotions and feelings b. record and share personal experiences involving an emotion or a feeling	a. inquire about and express emotions and feelings in a variety of familiar contexts b. compare the expression of emotions and feelings in a variety of informal situations

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General Outcome for Applications
Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

A–3 to get things done

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
A–3.1 guide actions of others	a. indicate basic needs and wants b. give and respond to simple oral instructions or commands c. suggest a course of action and respond to a suggestion	a. make and respond to a variety of simple requests b. seek, grant and withhold permission c. relay simple messages d. encourage or discourage others from a course of action e. give and follow a simple sequence of instructions	a. make and respond to suggestions in a variety of situations b. give, follow and respond to advice and warnings
A–3.2 state personal actions	a. respond to offers, invitations and instructions b. ask or offer to do something c. indicate choice from among several options	a. express a wish or a desire to do something b. make and respond to offers and invitations c. inquire about and express ability and inability to do something	a. state personal actions in the past, present and future b. make a promise and express intention in a variety of situations
A–3.3 manage group actions	a. engage in turn taking b. encourage other group members to act appropriately c. ask for help or for clarification of what is being said or done in the group	a. suggest, initiate or direct action in group activities b. encourage other group members to participate c. assume a variety of roles and responsibilities as group members d. negotiate in a simple way with peers in small-group tasks e. offer to explain or clarify	a. check for agreement and understanding b. express disagreement in an appropriate way c. express appreciation, enthusiasm, support and respect for contributions of others

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General Outcome for Applications
Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

A–4 to enhance their knowledge of the world

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
A–4.1 discover and explore	a. investigate the immediate environment b. investigate the surrounding environment c. investigate and identify elements in the immediate environment	a. make and talk about personal observations b. ask questions to gain knowledge and to clarify understanding c. discover relationships and patterns	a. explore classification systems and criteria for categories b. explore meaning in what they are doing
A–4.2 gather and organize information	a. gather simple information b. organize items in different ways c. sequence items in different ways	a. record and share personal knowledge of a topic b. compare and contrast items in simple ways c. gather information from a variety of resources	a. compose questions to guide research b. identify sources of information c. record observations d. gather information, using a prepared format
A–4.3 solve problems	a. experience problem-solving situations b. experience meaning through a variety of problem-solving experiences, stories and legends	a. reflect upon problem-solving experiences, stories and legends	a. reflect upon problem-solving experiences, stories and legends
A–4.4 explore perspectives and values	a. listen attentively and respectfully to the ideas and thoughts expressed b. respond sensitively to the ideas and products of others c. make connections between behaviour and values	a. recognize and respect differences in ideas and thoughts b. explore Cree views and values on a variety of topics from within their direct experience c. explore how Cree views and values influence behaviour	a. gather thoughts, ideas and opinions on a topic within their own experience; e.g., from peers, from family, from Elders b. explore how Cree views and values influence personal behaviour and choices

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General Outcome for Applications
Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

A–5 for imaginative purposes and personal enjoyment

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
A–5.1 humour/fun	a. use the language for fun	a. use the language for fun and to interpret humour	a. use the language for fun and to interpret and express humour
A–5.2 creative/aesthetic purposes	a. use the language creatively; e.g., participate in activities that play on the sounds and rhythms of the language	a. use the language creatively and for aesthetic purposes; e.g., write poems based on simple, repetitive and modelled language	a. use the language creatively and for aesthetic purposes; e.g., write new words to a known melody
A–5.3 personal enjoyment	a. use the language for personal enjoyment; e.g., listen to favourite music	a. use the language for personal enjoyment; e.g., listen to favourite songs in Cree, play games alone or with friends	a. use the language for personal enjoyment; e.g., find a personal pen pal and exchange letters

A–6 to form, maintain and change interpersonal relationships

	Students will be able to:		
A–6.1 manage personal relationships	a. exchange simple greetings and simple social expressions b. exchange some basic personal information c. initiate relationships d. acknowledge kinship relationships	a. talk about themselves and their family and respond to the talk of others by showing attention and interest b. identify kinship relationships c. initiate and participate in casual and friendly exchanges with classmates	a. make and break social engagements

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Language Competence

interpret and produce oral texts

attend to the form of the language

interpret and produce written and visual texts

Students will be effective, competent and comfortable as Cree speakers.
(*Okiskinamawâkanak ka/ta nihtâ nehiyawewak*.)

apply knowledge of the sociocultural context

apply knowledge of how the language is organized, structured and sequenced

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LANGUAGE COMPETENCE

Language competence is a broad term that includes linguistic or grammatical competence, discourse competence, sociolinguistic or sociocultural competence and what might be called textual competence. The specific outcomes under Language Competence deal with knowledge of the Cree language and the ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used. Language competence is best developed in the context of activities or tasks in which the language is used for real purposes—in other words, in practical **applications**.

The various components of language competence are grouped under five cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of language competence. For example, under the cluster heading "attend to the form of the language," there are strands for phonology (pronunciation, stress, intonation), orthography (spelling, mechanical features), lexicon (vocabulary words and phrases) and grammatical elements (syntax and morphology).

Although the outcomes isolate these individual aspects, language competence should be developed through classroom activities that focus on meaningful uses of the Cree language and on **language in context**. Tasks will be chosen based on the needs, interests and experiences of students. The vocabulary, grammar structures, text forms and social conventions necessary to carry out a task will be taught, practised and assessed as students are involved in various aspects of the task itself, **not in isolation**.

Strategic competence is often closely associated with language competence, since students need to learn ways to compensate for low proficiency in the early stages of learning if they are to engage in authentic language use from the beginning. This component is included in the language use strategies in the Strategies section.

It is important that the focus of the Language Competence component be on interaction and meaningfulness, with special attention and emphasis being given to oral communication.

Note: The following abbreviations are used in the grammatical elements section, under the cluster heading "attend to the form of the language":

NA	Animate noun
NI	Inanimate noun
VAI	Animate intransitive verb
1S	First person singular
2S	Second person singular
3S	Third person singular
1P	First person plural
2I	Second person inclusive
2P	Second person plural
3P	Third person plural

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–1 attend to the form of the language

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
LC–1.1 phonology	a. pronounce some common words and phrases comprehensibly b. use intonation to express meaning c. distinguish particular sounds of the language; e.g., t/d, k/g, c/ts, p/b and pre-aspirated h	a. pronounce familiar words, phrases and expressions with proper intonation b. recognize and pronounce basic sounds consistently c. recognize the effects of sounds; i.e., elision, long vowels	a. recognize the rhythmic flow of sounds b. enunciate unfamiliar words independently and confidently
LC–1.2 orthography	a. demonstrate awareness of the existence of syllabics	a. distinguish between Roman orthography and Cree syllabics b. recognize and use some of the basic spelling patterns and mechanical conventions used in the local community	a. produce the Cree syllabics characters, using a syllabics chart b. use the basic spelling patterns and mechanical conventions of the local community consistently in writing familiar words and phrases
LC–1.3 lexicon	a. use a repertoire of words and phrases (vocabulary) in familiar contexts, within a variety of lexical fields, including: • my family and friends • my body • my school • clothing • food • weather, seasons and time • any other lexical fields that meet their needs and interests	a. use a repertoire of words and phrases (vocabulary) in familiar contexts, within a variety of lexical fields, including: • community and neighbourhood • healthy living • caring for the land • my family traditions • music, dance, arts and crafts • any other lexical fields that meet their needs and interests	a. use a repertoire of words and phrases (vocabulary) in familiar contexts, within a variety of lexical fields, including: • world of work • leisure activities • traditional life • future plans • relationships • any other lexical fields that meet their needs and interests

(continued)

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

(continued)

LC–1 attend to the form of the language

Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y

Students will be able to:

a. use, in modelled situations,[1] the following grammatical elements: .....

LC–1.4 grammatical elements

Question Marker
cî

Interrogatives
awîna (who)
kîkwây (what)
tân'te (where)
tân'spî (when)

Demonstrative Pronouns
awa (this is – NA)
ôma (this is – NI)
ôki (NA) *aniki* (NA)
ôhi (NI) *anihi* (NI)

Animate Intransitive Verbs in Present Tense
e.g., *api* (sit), *nipâ* (sleep)

Colours
Animate/inanimate; e.g.,
kaskitesiw atim (NA)
kaskitewâw tehtapôwin (NI)

Conjunct Mode
e.g., *emîc'soyân* (I am eating)

Demonstrative Pronouns
nema (NI)

Personal Pronouns (Singular)
Emphatic agreement
nîsta
kîsta
wîsta

Emphatic Agreements (Plurals)
1P *nîstanân*
2P *kîstawâw*
3P *wîstawâw*

Possessive Pronouns (NA)
nikâwîyinân
kikâwîyinaw
kikâwîyiwâw
okâwîyiwâwa
okâwîyiyiwa
nîtisâninânak
kîtisâninawak
kîtisâniwâwak
wîtisâniwâwa
wîtisâniyiwa

Personal Pronouns (Plural)
1P *nîyanân*
2I *kîyânaw*
2P *kîyawâw*
3P *wîyawâw*

Emphatic Agreements (Plurals)
2I *kîstanaw*

(continued)

1. Modelled Situations: This term is used to describe learning situations where a model of specific linguistic elements is consistently provided and immediately available. Students in such situations will have an emerging awareness of the linguistic elements and will be able to apply them in very limited situations. Limited fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

(continued)

LC–1 attend to the form of the language

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
LC–1.4 grammatical elements	***Immediate Imperatives (VAI)*** 2S *api* 2P *apik* 2I *apitân* ***Personal Pronouns (Singular)*** 1S *nîya* (I) 2S *kîya* (you) 3S *wîya* (she/he)	***Possessive Pronouns (NI)*** *nimaskisininân* *kimaskisinaw* *kimaskisiniwâw* *omaskisiniwâw* *omaskisiniyiw* *nîkinân* *kîkinaw* *kîkiwâw* *wîkiwâw* *wîkiyiw*	

(continued)

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

(continued)

LC–1 attend to the form of the language

Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y

Students will be able to:

b. use, in structured situations,[2] the following grammatical elements: .....

LC–1.4 grammatical elements

Possessive Pronouns (NI)
nimaskisin, kimaskisin, omaskisin
nîki, kîki, wîki

Possessive Pronouns (NA)
nikâwîy, kikâwîy, okâwiya, nîtisânak, kîtisânak, wîtisâna

Question Marker
cî

Colours
Animate/inanimate; e.g.,
kaskitesiw atim (NA)
kaskitewâw tehtapôwin (NI)

Demonstrative Pronouns
awa (this is – NA)
ôma (this is – NI)
ôki (NA) *aniki* (NA)
ôhi (NI) *anihi* (NI)

Immediate Imperatives (VAI)
2S *api*
2P *apik*
2I *apitân*

Animate Intransitive Verbs in Present Tense
e.g., *api* (sit), *nipâ* (sleep)

Possessive Pronouns (NI)
nimaskisin, kimaskisin, omaskisin
nîki, kîki, wîki

Possessive Pronouns (NA)
nikâwîy, kikâwîy, okâwiya, nîtisânak, kîtisânak, wîtisâna

Conjunct Mode
e.g., *emîc'soyân* (I am eating)

Demonstrative Pronouns
nema (NI)

Personal Pronouns (Singular)
Emphatic agreement
nîsta
kîsta
wîsta

Emphatic Agreements (Plurals)
1P *nîstanân*
2P *kîstawâw*
3P *wîstawâw*

Possessive Pronouns (NA)
nikâwîyinân
kikâwîyinaw
kikâwîyiwâw
okâwîyiwâwa
okâwîyiyiwa
nîtisâninânak
kîtisâninawak
kîtisâniwâwak
wîtisâniwâwa
wîtisâniyiwa

Possessive Pronouns (NI)
nimaskisininân
kimaskisinaw
kimaskisiniwâw
omaskisiniwâw
omaskisiniyiw
nîkinân
kîkinaw
kîkiwâw
wîkiwâw
wîkiyiw

(continued)

2. Structured Situations: This term is used to describe learning situations where a familiar context for the use of specific linguistic elements is provided and students are guided in the use of these linguistic elements. Students in such situations will have increased awareness and emerging control of the linguistic elements and will be able to apply them in familiar contexts with teacher guidance. Student language is characterized by increasing fluency and confidence.

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

(continued)

LC–1 attend to the form of the language

Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y

Students will be able to:

c. use, independently and consistently,[3] the following grammatical elements: .....

LC–1.4
grammatical elements

Question Marker
cî

Demonstrative Pronouns
awa (this is – NA)
ôma (this is – NI)
ôki (NA) *aniki* (NA)
ôhi (NI) *anihi* (NI)

Colours
Animate/inanimate; e.g.,
kaskitesiw atim (NA)
kaskitewâw tehtapôwin (NI)

Possessive Pronouns (NI)
nimaskisin, kimaskisin, omaskisin
nîki, kîki, wîki

Possessive Pronouns (NA)
nikâwîy, kikâwîy, okâwiya,
nîtisânak, kîtisânak, wîtisâna

Conjunct Mode
e.g., *emîc'soyân* (I am eating)

Animate Intransitive Verbs in Present Tense
e.g., *api* (sit), *nipâ* (sleep)

Immediate Imperatives (VAI)
2S *api*
2P *apik*
2I *apitân*

3. Independently and Consistently: This term is used to describe learning situations where students use specific linguistic elements consistently in a variety of contexts with limited or no teacher guidance. Fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–2 interpret and produce oral texts

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
LC–2.1 listening	a. understand a series of simple spoken sentences in guided situations	a. understand short, simple oral texts on familiar topics in guided situations	a. understand short, simple oral texts in guided and unguided situations
LC–2.2 speaking	a. produce words, phrases and simple sentences, orally, in guided situations	a. produce short, simple oral texts in guided situations	a. produce short oral texts on familiar topics in guided and unguided situations
LC–2.3 interactive fluency	a. engage in simple interactions, using short, simple words and phrases	a. engage in simple interactions, using simple sentences	a. manage short interactions with ease, with pauses to formulate oral text, and self-correct

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–3 interpret and produce written and visual texts

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
LC–3.1 reading	a. understand a series of simple written sentences in guided situations	a. understand short, simple written texts in guided situations	a. understand short, simple written texts in guided and unguided situations
LC–3.2 writing	a. produce written words, phrases and simple sentences in guided situations	a. produce a series of simple written sentences in guided situations	a. produce short, simple written texts in guided situations
LC–3.3 viewing	a. derive meaning from a variety of visuals and other forms of nonverbal communication in guided situations	a. derive meaning from visual elements in a variety of media in guided and unguided situations	a. derive meaning from multiple visual elements in a variety of media in guided situations
LC–3.4 representing	a. use a variety of visuals and other forms of nonverbal communication to express meaning in guided situations	a. express meaning through the use of visual elements in a variety of media in guided situations	a. express meaning through the use of multiple visual elements in a variety of media in guided situations

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–4 apply knowledge of the sociocultural context

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
LC–4.1 register	a. recognize and use some forms of address denoting respect b. distinguish between formal and informal situations	a. experiment with and use formal and informal language and behaviours in familiar situations	a. explore formal and informal language and behaviours in a variety of contexts
LC–4.2 expressions	a. understand and use some simple expressions as set phrases	a. use learned expressions in new contexts to enhance communication	a. use learned expressions in a variety of contexts
LC–4.3 variations in language	a. experience a variety of voices b. acknowledge and accept individual differences in speech and language	a. experience a variety of accents, variations in speech and regional variations in language	a. recognize some common regional influences and other influences resulting in variations in language
LC–4.4 social conventions	a. use basic social expressions appropriate to the classroom b. use basic politeness conventions	a. use appropriate oral forms of address for people frequently encountered b. recognize simple social conventions in informal conversations	a. recognize important social conventions in everyday interactions; e.g., shaking hands b. interpret the use of social conventions encountered in oral and written texts
LC–4.5 nonverbal communication	a. understand the meaning of, and imitate, some common nonverbal behaviours b. experiment with using some simple nonverbal means of communication	a. recognize that some nonverbal behaviours may be inappropriate in certain contexts b. recognize and use appropriate nonverbal behaviours in a variety of familiar contexts; e.g., eye contact	a. use appropriate nonverbal behaviour in a variety of familiar contexts b. recognize nonverbal behaviours that are considered impolite

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–5 apply knowledge of how the language is organized, structured and sequenced

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
LC–5.1 cohesion/ coherence	a. link words or groups of words in simple ways b. sequence elements of a simple story, process or series of events	a. link several sentences coherently b. use common conventions to structure texts; e.g., titles, paragraphs	a. organize texts, using common patterns b. organize texts to indicate steps in a procedure or directions to follow
LC–5.2 text forms	a. experience and recognize some simple oral text forms	a. recognize simple oral and written text forms b. use some simple text forms in their own productions	a. recognize a variety of text forms delivered through a variety of media
LC–5.3 patterns of social interaction	a. initiate interactions and respond, using very simple social interaction patterns	a. initiate interactions and respond, using simple social interaction patterns b. use simple conventions to open and close conversations and to manage turn taking	a. initiate interactions and respond, using a variety of simple social interaction patterns

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Community Membership

Kikâwînaw Askiy (Mother Earth★)

others

Students will live (*wa)wetina(hk)* (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

themselves

★ discretionary (see further details on p. 30)

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COMMUNITY MEMBERSHIP

The specific outcomes in the Community Membership section are intended to support many aspects of the students' Cree cultural development. These outcomes are grouped under three cluster headings—see the illustration on the preceding page. Each cluster is further broken down into five strands, each of which strives to build a specific knowledge, skill or value from Grade 10 to Grade 12. The five strands are as follows:

- relationships
- knowledge of past and present
- practices and products
- past and present perspectives
- diversity.

The terms "Mother Earth" and "Creator" are identified as discretionary terms in this program of studies. Communities may choose to use these terms or to use other related terms acceptable to them (e.g., nature, the environment) in order to teach the outcomes in this section.

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General Outcome for Community Membership
Students will live *(wa)wetina(hk)* (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

CM–1 *Kikâwînaw Askiy* (Mother Earth★)

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
CM–1.1 relationships	a. observe, experience and explore *Kikâwînaw Askiy* (Mother Earth★) b. participate in harmonious activities and experiences related to *Kikâwînaw Askiy* (Mother Earth★)	a. participate in activities in which they care for and respect *Kikâwînaw Askiy* (Mother Earth★) b. identify concrete ways in which they can show respect for *Kikâwînaw Askiy* (Mother Earth★)	a. demonstrate leadership in caring for and respecting *Kikâwînaw Askiy* (Mother Earth★) b. examine their own treatment of, and attitudes toward, *Kikâwînaw Askiy* (Mother Earth★); e.g., planting and hunting practices
CM–1.2 knowledge of past and present	a. participate in activities and experiences that convey knowledge of past and present *Kikâwînaw Askiy* (Mother Earth★)	a. explore past and present Cree regions in Canada	a. identify and describe basic facts about some Cree geographical regions or communities b. explore and examine aspects of *Kikâwînaw Askiy* (Mother Earth★)
CM–1.3 practices and products	a. participate in activities, experiences and practices related to *Kikâwînaw Askiy* (Mother Earth★)	a. explore basic practices and products related to *Kikâwînaw Askiy* (Mother Earth★)	a. identify and describe basic practices and products related to *Kikâwînaw Askiy* (Mother Earth★) b. explore the significance of practices and products related to *Kikâwînaw Askiy* (Mother Earth★)
CM–1.4 past and present perspectives	a. participate in activities and experiences that reflect past and present Cree perspectives related to *Kikâwînaw Askiy* (Mother Earth★)	a. explore past and present Cree values related to *Kikâwînaw Askiy* (Mother Earth★)	a. identify and examine traditional Cree perspectives and values related to *Kikâwînaw Askiy* (Mother Earth★) b. examine their own perspectives, opinions and views related to *Kikâwînaw Askiy* (Mother Earth★)
CM–1.5 diversity	a. participate in activities and experiences that reflect diversity in perspectives related to *Kikâwînaw Askiy* (Mother Earth★)	a. explore diverse Cree values related to *Kikâwînaw Askiy* (Mother Earth★)	a. identify and examine diverse Cree perspectives and values related to *Kikâwînaw Askiy* (Mother Earth★)

★discretionary (see further details on p. 30)

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General Outcome for Community Membership
Students will live *(wa)wetina(hk)* (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

CM–2 others

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
CM–2.1 relationships	a. share with others and recognize that others are a part of their living world/kinship systems b. listen respectfully to others; i.e., storytelling, counsel, sharing circle c. contribute to, and cooperate in, activities with others and practise friendliness	a. practise consideration and helpfulness toward others b. respect others (e.g., property, thoughts) and practise humility c. form positive relationships with others; e.g., peers, family, Elders	a. form meaningful/special relationships with others; e.g., girl-aunt relationships, joking relationships, same name b. form and maintain authentic, respectful relationships with others; e.g., opposite sex
CM–2.2 knowledge of past and present	a. participate in activities and experiences that convey knowledge of historical and contemporary Cree culture; i.e., storytelling, celebrations	a. explore past and present Cree people, practices, products and beliefs in Canada	a. explore key Cree historical and contemporary events, figures and developments; e.g., residential schools, Elijah Harper, Louis Riel, treaties, Big Bear
CM–2.3 practices and products	a. observe and participate in family and/or school Cree cultural experiences, practices and activities	a. explore cultural practices and products of Cree peoples in Canada	a. identify and describe key Cree cultural practices and products b. explore the significance of Cree cultural practices and products
CM–2.4 past and present perspectives	a. observe and participate in activities, experiences and products that reflect past and present perspectives, and explore change	a. examine past and present perspectives and values and examine change	a. identify and explore past and present perspectives and values and celebrate change b. identify and explore basic Cree perspectives and values
CM–2.5 diversity	a. observe and identify the unique qualities of others; e.g., family	a. explore and compare characteristics of Cree-speaking peoples in Canada	a. explore Cree-speaking cultural groups as part of larger Aboriginal communities b. appreciate and respect similarities and differences in others

★discretionary (see further details on p. 30)

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General Outcome for Community Membership
Students will live *(wa)wetina(hk)* (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

CM–3 themselves

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
CM–3.1 relationships	a. express their own concept of themselves and extend that understanding to include new ideas and perspectives; i.e., home and school	a. express their own concept of themselves and understand their own strengths and abilities b. explore various sources of information for development of their self-concept and learn and understand the importance of respect for themselves c. identify influences on development of their self-concept and self-identity	a. reflect on various facets of self-identity b. understand self-concept and the factors that may affect it and understand the importance of developing a positive self-concept and self-identity
CM–3.2 knowledge of past and present	a. share about themselves and their family (traditions, nicknames, practices) b. explore kinship and community	a. explore and examine family/community traditions and practices b. explore their family/community background (tribe/heritage/ affiliation, kinship) c. explore Cree peoples in Canada	a. explore and examine their own cultural heritage
CM–3.3 practices and products	a. observe and participate in Cree cultural experiences, practices and activities	a. explore Cree cultural experiences, practices and products	a. identify and explore Cree cultural experiences, practices and products b. explore the personal significance of Cree cultural practices and products
CM–3.4 past and present perspectives	a. explore their own change and listen to others' views and stories b. express their own understanding of themselves, their family and their community and explore others' perceptions	a. understand their own strengths and weaknesses b. explore how others perceive them c. recognize that individuals change and the way they see themselves changes	a. recognize the effects, on themselves, of positive and negative treatment; i.e., stereotyping

(continued)

★discretionary (see further details on p. 30)

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General Outcome for Community Membership
Students will live *(wa)wetina(hk)* (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

(continued)

CM–3 themselves

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
CM–3.5 diversity	a. observe, celebrate and recognize their own uniqueness; e.g., self, family b. identify and celebrate unique characteristics of their family and community	a. identify and celebrate their unique strengths and abilities b. explore, identify and celebrate unique characteristics of their family and community c. explore, identify and celebrate unique characteristics of Cree peoples in Canada	a. explore, examine and celebrate their own unique cultural heritage

★discretionary (see further details on p. 30)

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Strategies

language learning

language use

Students will use strategies to maximize learning and communication.

cultural learning

general learning

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STRATEGIES

Under the Strategies heading are specific outcomes that will help students learn and communicate more **effectively**. Strategic competence has long been recognized as an important component of communicative competence. The learning outcomes that follow deal not only with compensation and repair strategies, important in the early stages of language learning when proficiency is low, but with strategies for language learning, language use in a broader sense and cultural learning, and with general learning strategies that help students acquire content. Although people may use strategies unconsciously, the learning outcomes deal only with the **conscious use** of strategies.

The strategies are grouped under four cluster headings—see the illustration on the preceding page. For the Strategies component, the strands mirror the cluster headings. Each cluster heading or strand deals with a specific category of strategy. Language learning, cultural learning and general learning strategies can be further categorized as cognitive, metacognitive and social/affective. The language use strategies can be further categorized by communicative mode: interactive, interpretive, productive.

The strategies that students choose depend on the task they are engaged in as well as on other factors, such as their preferred learning style, personality, age, attitude and cultural background. Strategies that work well for one person may not be effective for another person, or may not be suitable in a different situation. For this reason, it is not particularly useful to say that students should be aware of, or able to use, a specific strategy in a particular course. Consequently, the specific outcomes make only general references to strategies within each category. Specific strategies for each category are included in the sample list of strategies below. The specific strategies provided in the sample list **are not prescriptive** but are provided as an illustration of how the general strategies in the specific outcomes might be developed.

Teachers need to know and model a broad range of strategies from which students are then able to choose in order to communicate effectively. Strategies of all kinds are best taught in the context of learning activities where students can apply them immediately and then reflect on their use.

SAMPLE LIST OF STRATEGIES

Language Learning Strategies

Cognitive

- listen attentively
- perform actions to match the words of a song, story or rhyme
- learn short rhymes or songs, incorporating new vocabulary or sentence patterns
- imitate sounds and intonation patterns
- memorize new words by repeating them silently or aloud
- seek the precise term to express meaning
- repeat words or phrases in the course of performing a language task
- make personal dictionaries
- experiment with various elements of the language
- use mental images to remember new information
- group together sets of things—vocabulary, structures—with similar characteristics
- identify similarities and differences between aspects of the Cree language and English
- look for patterns and relationships
- use previously acquired knowledge to facilitate a learning task
- associate new words or expressions with familiar ones, either in Cree or in English
- find information, using reference materials such as dictionaries, textbooks and grammars
- use available technological aids to support language learning; e.g., cassette recorders, computers, CD–ROMs
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember
- place new words or expressions in a context to make them easier to remember

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- use induction to generate rules governing language use
- seek opportunities in and outside of class to practise and observe
- perceive and note down unknown words and expressions, noting also their context and function

Metacognitive
- check copied writing for accuracy
- make choices about how you learn
- rehearse or role-play language
- decide in advance to attend to the learning task
- reflect on learning tasks with the guidance of the teacher
- make a plan in advance about how to approach a language learning task
- reflect on the listening, speaking, reading and writing process
- decide in advance to attend to specific aspects of input
- listen or read for key words
- evaluate your performance or comprehension at the end of a task
- keep a learning checklist
- experience various methods of language acquisition, and identify one or more considered to be particularly useful personally
- be aware of the potential of learning through direct exposure to the language
- know how strategies may enable coping with texts containing unknown elements
- identify problems that might hinder successful completion of a task, and seek solutions
- monitor your speech and writing to check for persistent errors
- be aware of your strengths and weaknesses, identify your needs and goals, and organize strategies and procedures accordingly

Social/Affective
- initiate or maintain interaction with others
- participate in shared reading experiences
- seek the assistance of a friend to interpret a text
- reread familiar self-chosen texts to enhance understanding and enjoyment
- work cooperatively with peers in small groups
- understand that making mistakes is a natural part of language learning
- experiment with various forms of expression, and note their acceptance or nonacceptance by more experienced speakers
- participate actively in brainstorming and conferencing as prewriting and postwriting exercises
- use self-talk to feel competent to do the task
- be willing to take risks and to try unfamiliar tasks and approaches
- repeat new words and expressions occurring in your conversations, and make use of these new words and expressions as soon as appropriate
- reduce anxiety by using mental techniques, such as positive self-talk or humour
- work with others to solve problems and get feedback on tasks
- provide personal motivation by arranging your own rewards when successful

Language Use Strategies

Interactive
- use English to get meaning across
- use a literal translation of a phrase in English
- use an English word but pronounce it as in Cree
- acknowledge being spoken to with appropriate expression
- interpret and use a variety of nonverbal cues to communicate; e.g., mime, pointing, gestures, pictures
- indicate lack of understanding verbally or nonverbally
- ask for clarification or repetition when you do not understand
- use other speakers' words in subsequent conversations
- assess feedback from a conversation partner to recognize when a message has not been understood; e.g., blank look
- start again, using a different tactic, when communication breaks down
- invite others into the discussion
- ask for confirmation that a form used is correct

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- use a range of fillers, hesitation devices and gambits to sustain conversations
- use circumlocution to compensate for lack of vocabulary

Interpretive

- use gestures, intonation and visual supports to aid comprehension
- make connections between texts on the one hand and prior knowledge and personal experience on the other
- use illustrations to aid reading comprehension
- determine the purpose of listening
- listen or look for key words
- listen selectively based on purpose
- make predictions about what you expect to hear or read based on prior knowledge and personal experience
- use knowledge of the sound–symbol system to aid reading comprehension
- infer probable meanings of unknown words or expressions from contextual clues
- prepare questions or a guide to note down information found in a text
- use key content words or discourse markers to follow an extended text
- reread several times to understand complex ideas
- summarize information gathered
- assess your information needs before listening, viewing or reading
- use skimming and scanning to locate key information in texts

Productive

- mimic what the teacher says
- use nonverbal means to communicate
- copy what others say or write
- use words visible in the immediate environment
- use resources to increase vocabulary
- use familiar repetitive patterns from stories, songs, rhymes or media
- use illustrations to provide detail when producing your own texts
- use knowledge of sentence patterns to form new sentences
- use a variety of resources to correct texts; e.g., personal and commercial dictionaries, checklists, grammars
- take notes when reading or listening to assist in producing your own text
- revise and correct final versions of texts
- use circumlocution and definition to compensate for gaps in vocabulary
- apply grammar rules to improve accuracy at the correction stage
- compensate for avoiding difficult structures by rephrasing

Cultural Learning Strategies

Cognitive

- observe and listen attentively
- actively participate in culturally relevant activities, such as storytelling, ceremonies, berry picking, feasts, fish scale art and sewing
- imitate cultural behaviours
- memorize specific protocols, such as prayers, songs and stories
- seek out information by asking others, such as parents, teachers and Elders
- repeat or practise saying or performing cultural practices or traditions, such as prayers, songs, words and actions
- make/create cultural learning logs
- experiment with, and engage in, various cultural practices and elements
- use mental images to remember new cultural information, such as Teepee Teachings
- group together sets of things—cultural practices, objects—with similar characteristics
- identify similarities and differences between aspects of Cree culture and other cultures to which you have been exposed
- look for patterns and relationships
- use previously acquired knowledge to facilitate cultural learning
- associate new cultural learnings with previous knowledge
- use available technological aids to support cultural learning; e.g., computers, videos/ DVDs, CD–ROMs
- use mind maps, webs or diagrams
- place new cultural learning in a context to make it easier to remember

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- use induction to generate rules governing cultural elements, such as values, traditions, beliefs, practices and relationships
- seek opportunities in and outside of class to practise, observe and participate in cultural activities/elements
- perceive and note down unknown cultural elements and practices

Metacognitive
- make choices about how you learn
- rehearse or role-play a cultural experience
- decide in advance to attend to the cultural learning task
- reflect on cultural learning tasks
- think in advance about how to approach a cultural learning task
- reflect on your learning or inquiries
- decide in advance to attend to specific aspects of a cultural event
- listen for, or observe, key cultural elements
- evaluate your performance or comprehension at the end of a cultural task or activity
- keep a cultural learning/teachings checklist
- experience various methods of learning about culture, and identify one or more considered to be particularly useful personally; e.g., by doing it, observing it, reading about it
- be aware of the potential of learning through direct exposure to the culture
- know how strategies may enable coping with new cultural experiences containing unknown elements
- identify obstacles that might hinder successful participation in cultural experiences, and see ways to overcome these obstacles
- monitor your cultural behaviours and practices
- be aware of your strengths and weaknesses, identify your needs and goals, and organize strategies and processes accordingly

Social/Affective
- initiate and maintain participation in the culture
- participate in shared cultural experiences
- seek the assistance of a friend, teacher, Elder or parent to understand cultural elements
- participate several times in favourite cultural experiences and activities to enhance understanding and enjoyment
- work cooperatively with peers in small groups
- understand that making mistakes is a natural part of learning about culture
- experiment with various cultural behaviours and practices, noting acceptance/support or nonacceptance/lack of support by members of the culture
- participate actively in the traditions of the culture; i.e., storytelling, sharing circle
- be willing to take risks and to try new/unfamiliar things
- apply new cultural learnings as soon as possible after learning/observing them
- reduce anxiety by using mental techniques, such as positive self-talk or humour
- work cooperatively with others, and get feedback on your work
- provide personal motivation by arranging your own rewards when successful

General Learning Strategies

Cognitive
- classify objects and ideas according to their attributes; e.g., red objects and blue objects, or animals that eat meat and animals that eat plants
- use models
- connect what is already known with what is being learned
- experiment with, and concentrate on, one thing at a time
- focus on and complete learning tasks
- record key words and concepts in abbreviated form—verbal, graphic or numerical—to assist with performance of a learning task
- use mental images to remember new information
- distinguish between fact and opinion when using a variety of sources of information
- formulate key questions to guide research
- make inferences, and identify and justify the evidence on which these inferences are based
- use word maps, mind maps, diagrams, charts or other graphic representations to make

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information easier to understand and remember
- seek information through a network of sources, including libraries, the Internet, individuals and agencies
- use previously acquired knowledge or skills to assist with a new learning task

Metacognitive
- reflect on learning tasks with the guidance of the teacher
- choose from among learning options
- discover how your efforts can affect learning
- reflect upon your thinking processes and how you learn
- decide in advance to attend to the learning task
- divide an overall learning task into a number of subtasks
- make a plan in advance about how to approach a task
- identify your needs and interests
- manage your physical working environment
- keep a learning journal, such as a diary or a log
- develop criteria for evaluating your work
- work with others to monitor your learning
- take responsibility for planning, monitoring and evaluating learning experiences

Social/Affective
- watch others' actions and copy them (the actions of Aboriginal students, maybe, more than others)
- seek help from others
- follow your natural curiosity and intrinsic motivation to learn
- participate in cooperative group learning tasks
- choose learning activities that enhance understanding and enjoyment
- be encouraged to try, even though mistakes might be made
- take part in group decision-making processes (consensus)
- use support strategies to help peers persevere at learning tasks; e.g., offer encouragement, praise and ideas
- take part in group problem-solving processes
- use self-talk to feel competent to do the task
- be willing to take risks and to try unfamiliar tasks and approaches
- monitor your level of anxiety about learning tasks, and take measures to lower it if necessary; e.g., deep breathing, laughter
- use social interaction skills to enhance group learning activities

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General Outcome for Strategies
Students will use strategies to maximize learning and communication.

S–1 language learning

	Cree Language and Culture 10-3Y	Cree Language and Culture 20-3Y	Cree Language and Culture 30-3Y
	Students will be able to:		
S–1.1 language learning	a. use simple strategies, with guidance, to enhance language learning	a. identify and use a variety of strategies to enhance language learning	a. select and use a variety of strategies to enhance language learning

S–2 language use

	Students will be able to:		
S–2.1 language use	a. use simple strategies, with guidance, to enhance language use	a. identify and use a variety of strategies to enhance language use	a. select and use a variety of strategies to enhance language use

S–3 cultural learning

	Students will be able to:		
S–3.1 cultural learning	a. use simple strategies, with guidance, to enhance cultural learning	a. identify and use a variety of strategies to enhance cultural learning	a. select and use a variety of strategies to enhance cultural learning

S–4 general learning

	Students will be able to:		
S–4.1 general learning	a. use simple strategies, with guidance, to enhance general learning	a. identify and use a variety of strategies to enhance general learning	a. select and use a variety of strategies to enhance general learning

Examples of language learning, language use, cultural learning and general learning strategies are available on pages 36 to 40.

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CREE LANGUAGE AND CULTURE 10-6Y, 20-6Y, 30-6Y

This program of studies is intended for students who began their study of Cree language and culture in Grade 7. It constitutes the last three years of the Cree Language and Culture Six-year (6Y) Program. The Cree Language and Culture Six-year Program, Grades 7–8–9, constitutes the first three years of the six-year program.

PHILOSOPHY

"Our way is a valid way of seeing the world."
– Western Canadian Protocol Aboriginal Languages Working Group

"Our tepees were round like the nests of birds … the nations hoop, a nest of many nests where the Great Spirit meant for us to hatch our children."
– Black Elk, Oglala Sioux Holy Man

ELDER AND COMMITTEE ADVISORS

The contents of this program of studies are drawn from the wisdom and ideas of countless Elders—past and present—Cree educators whose words enlighten and challenge both in person and in writing, and who are struggling with issues of language loss and language revitalization. In particular, the Cree Language and Culture Six-year Program Development Committee wishes to acknowledge the following Elders who advised some of the developmental stages of this document:

- Alfred Bonaise
- Jenny Cardinal
- Joe P. Cardinal
- Linda Oldpan
- Jerry Saddleback

The following individuals were also involved, in various capacities, in the development of this program of studies:

- Janice Aubry
- Loretta Breland
- Mary Cardinal-Collins
- Wayne Jackson
- Gena Kolay
- Donna Leask
- Jutta McAdam
- Tony Petrone
- Joan Simpson
- John Sokolowski
- Marion Stone
- Stuart Wachowicz

VOICES OF THE ELDERS

The wisdom of the Elders is central to cultural learning according to Cree perspective. Elders are the "keepers of knowledge," and it is their guidance that Cree people seek as they strive for balance in their relationships with *Omâmawi Ohtâwîmâw* (the Creator), the natural world, other people and themselves.

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The quotations in this section are intended to illustrate the vast wisdom of Aboriginal Elders as "keepers of knowledge" and as educators within a traditional system of learning. The Elders' comments are excerpted directly from *The Common Curriculum Framework for Aboriginal Language and Culture Programs, Kindergarten to Grade 12*, June 2000; and they reflect a wide variety of oral and written sources. Alberta Education acknowledges the necessity of guidance from the Elders if this program is truly to reflect Aboriginal perspective. Each community wishing to establish a language and culture program must turn to its own Elders for guidance. It is only with Elder support that Aboriginal language and culture programs can succeed in achieving the goal of language revitalization.

Aboriginal Education

Aboriginal educators and Elders have envisioned an education for their children that strengthens and inspires by focusing on traditional wisdom. They have envisioned an education where the young people of today are helped in creating a peaceful balance within themselves, using Aboriginal "laws" as a guide. The "laws" that govern life are not laws in the literal and mechanistic sense. They are perspectives that can help young people to orient themselves positively as Aboriginal people while establishing or strengthening their personal identities. They are perspectives that enable Aboriginal people to live with integrity, regardless of the environment or circumstances in which they find themselves.

Most importantly for Aboriginal educators, these perspectives are supported with an abundance of time-tested learning resources in the form of oral traditions. Stories from the oral tradition have been used in formal classrooms in the past. They are recognized as valuable and integral learning resources, and they become more valuable as the perspectives they communicate are understood, recognized and accepted as legitimate.

The various forms, such as legends and stories, need to be understood as culturally significant and authentic. As an example, legends (*âtayohkewina*) are formalized in much the same way as essay writing is. There is a protocol for obtaining legends or stories from storytellers. In addition, there are various styles of stories, such as miraculous, humorous or historical.

Here, in their words, are Aboriginal voices that speak clearly and persuasively about the need for, and the right to, language and culture programs based on Aboriginal perspectives.

Perspectives-based Culture and Language Education

The Aboriginal perspective is as useful today as it was in the past in helping people live with integrity, especially as people relocate into urban areas or away from kin.

"We came from a system of laws and relationships. The laws were the parameters of acceptable behaviour within each relationship. Our lifestyles have changed a lot but the necessity to survive with integrity is still with me. We must elevate our discussion in a way that we can identify the principles."

– Wes Fineday, Regina, Saskatchewan

"Business cannot be separated from the environment. The environment cannot be separated from government. Government cannot be separated from social and economic issues. People cannot be separated from all of the above. Perhaps it is time to recognize this and make efforts to reinstate a whole-life perspective in education."

– Patrick Kelly, Sto:lo Nation (1991, p. 145)

The Aboriginal perspective will guide young people in making choices that will prepare them for their future as capable adults; it will help them in understanding the value or purpose of things, or in making personal decisions; and it will help them to be empowered.

Language and culture are inseparable. Both are necessary to instill identity in its fullest sense.

"Language ... is not just a neutral instrument [for communication]. Rather, it shapes our very conceptualization of phenomena, such that some phenomena are not translatable into another language and some languages have no words for certain phenomena found in other cultures.... We Aboriginal people are forced to speak the foreign language of the English to convey a lot of our spirituality, our thought,

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our essence. Unfortunately, it is not adequate to the task. So, if people want to understand us and the things in which we take pride, they should learn our respective languages. I am proud of my Cree language and heritage."

– George Calliou, Cree, Sucker Creek, Alberta

Aboriginal Rights

There is a need and an inherent right to maintain the Aboriginal languages and cultures.

"Our kids are losing their identity. They don't know their history. My grandparents taught me the dangers, what to respect, etc. They told me to never forget where I came from. When our kids come out of school, who are they? Who do they belong to?"

– Roddy Blackjack, Little Salmon/Carmacks, Yukon Territory

Young people represent the future of our culture.

"We know that the world will be a much different place when our children become adults and take responsibility for our community. We must now decide what we want our children to know and what traditions to carry from our ancestors."

– Peigan Education Committee

The Aboriginal children will benefit from being taught the language and culture of their people.

"Indian parents have the right to directly influence the education of their children. This right, which was guaranteed through treaties, should never become a privilege."

– Alexis First Nation

Local Control

Past efforts have not been sufficient in stabilizing or revitalizing the Aboriginal languages and cultures.

"We now have a litany of what we have viewed as the one item that will save our languages. This one item is usually quickly replaced by another. For instance, some of us said, 'Let's get our languages into written form' and we did and still our Native American languages kept on dying.... Then we said, 'Let's develop culturally relevant materials' and we did and still our languages kept on dying. Then we said, 'Let's use language masters to teach our languages' and we did, and still our languages kept on dying.... 'Let's put our native language speakers on CD–ROM' .... Finally, someone will say, 'let's flash-freeze the remaining speakers of our languages' ...."

– Richard E. Littlebear (Cantoni, 1996, pp. xiii–xiv)

"In 1960 we started out by organizing ourselves to bring back our dances and songs. The young people are so willing to learn our ways. But I can't be out too much anymore. We are tired."

– Mary John, Prince George, British Columbia

"Some of those who are intent on learning the language feel frustrated at the lack of opportunity to use it, and find that they are not able to progress past a certain point without the chance for more language immersion experiences."

– Jan Hill, Mohawk (Freeman et al., 1995, p. 62)

Communities and schools must work together to strengthen the languages and cultures of the Aboriginal nations.

"To reverse this influence of English, families must retrieve their rightful position as the first teachers of our languages. They must talk our languages everyday, everywhere, with everyone, anywhere. But if they are going to relinquish this teaching responsibility to the schools then they must be supportive."

– Richard E. Littlebear (Cantoni, 1996, p. xiv)

Local communities are the ones to create and develop language and culture programs to suit their particular needs; e.g., language awareness packages designed for home use, promoting languages through the various media and encouraging fluent speakers in the service industry to use their Aboriginal language while interacting with their clientele.

"... the Aboriginal community must be the central decision maker in any initiative on Aboriginal language maintenance ... [and also] the support of the majority culture, and particularly policy makers, is essential in making Aboriginal language policies work."

– Barbara Burnaby (1996, p. 33)

"Over and over, people who have come to our communities to get information, go away and write up and interpret and when we see it, we don't recognize it. Which person? Which family? Which village was involved in developing the materials? We prefer our own way of learning."

– Mary John, Prince George, British Columbia

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Colonization and Reconstruction

From the perspective of the Aboriginal people, the post-contact period is characterized as a time of great dislocation. Colonizing forces disrupted the fundamental relationships of Aboriginal people and disrupted their way of being in the world.

In the early contact period, the relationship between the European and Aboriginal populations was one of mutual respect. For example, the treaties were signed by two nations. The spirit and intent of the treaties as understood by the Aboriginal people was that language and culture would be respected.

However, the forces of contact caused great disharmony and dislocation by enforcing the *Indian Act* of 1876 and the subsequent amendments. One of the most detrimental policies stemming from the *Indian Act* was the prohibition of ceremonial practices, thus limiting language and cultural transmission. The ensuing effects almost destroyed Aboriginal values and cultural identity, and served as a catalyst to the erosion of Aboriginal languages.

Despite the effects of colonialism, the perspectives and values of Aboriginal people are maintained.

"My grandmother was a boarding school product and on my mother's side, my father went to the same boarding school that I went to.... Like it seems that we lost about three generations of teachings but it was easy for us to go back to our teachings."

– Maria Linklator, Cree, Thunderchild First Nation (Saskatchewan Indian Cultural Centre, http://www.sicc.sk.ca/cgi-bin/sicc/epage.pl?162)

Aboriginal people work to maintain their identity as nations within Canada.

"Our culture is very important to us. I believe that if we lose our language, our dances, our music, our tales handed down from generation to generation by our elders, we lose what our country is to us.... We must keep our language, our culture, and our land so that, even in Canada, we can still feel that we have our own country."

– Mary John (Moran, 1988, pp. 141–142)

The mainstream culture has begun to explore, appreciate and apply Aboriginal perspectives for their inherent value.

"In labelling children as 'gifted' or 'not gifted,' rather than calling attention to their specific abilities, ... we begin thinking that children are naturally clustered into two well-defined groups, 'gifted' and 'non-gifted.' ...

"Cultural teachers in First Nations communities ... place a great deal of emphasis on spirituality—not to be confused with forms of organized religion! These teachers stress that each individual human has been designed by the Creator, and each of us has a specific purpose to fulfill on earth."

– John W. Friesen (1997, pp. 27–28)

Spirituality

Although the Elders strongly recommend that the connection to *Omâmawi Ohtâwîmâw* (the Creator) be interwoven throughout the program of studies, the developers and Elders themselves respect that individuals/teachers may not want to teach/promote this view. Above all, one's individual integrity is respected. Walter Linklator expressed this view when he said, "... we never force anybody because we are not supposed to do that. We just share and if that person wants to learn more then that person just keeps coming back to Elders to find out the importance of spiritual identity" (Saskatchewan Indian Cultural Centre, http://www.sicc.sk.ca/cgi-bin/sicc/epage.pl?161).

Laws of Relationship

"We use the circle as a means of teaching. It's not a straight line type of teaching that we use. With us, everything is connected and interconnected ..."

– Parent council member, Joe Duquette High School, Saskatoon, Saskatchewan (Haig-Brown et al., 1997, p. 96)

Our Relationship with the Natural World

People are not greater than the things in nature. The natural world has its own laws that must be respected if people are going to be sustained by it. People are identified by the land they have historically inhabited and on which they have learned to survive.

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Even today, it is necessary to live with the laws of nature and to feel a part of it.

"The time the Whiteman first came to this country, he saw there was a lot of land.... It was a beautiful land, a land that was here in order for us to make our living from it. This land provided us with things, gave us a good life and we were able to survive by all the resources available to us.... The Creator had placed them on the land for our use, and though they were taken, continues to protect us, which is why we were never completely destroyed and why we are still here today. If the Whiteman had a better understanding of what the land meant to us, he would have thought differently about us."

– John B. Tootoosis, Deceased, Poundmaker First Nation (Saskatchewan Indian Cultural Centre, http://www.sicc.sk.ca/cgi-bin/sicc/epage.pl?1)

Our Relationship with One Another

Agreement on rules enables cooperation and group strength, which is greater than individual strength.

Identity comes from being in respectful relationships with others, particularly in the family/clan, community and nation.

"Some of our family members are living in urban areas. That's no excuse. Families can still keep in touch and they need to.... The responsibility for anyone with any problem lies with the family 'cause this is the way our people were historically, 'cause that's where the basic help was all the time, whatever you dealt with. If a problem went beyond the control of the family, then it expanded to the larger family, you know, discussions of that. Failing that, then there were advisory groups responsible to the Chief who those problems could be placed under and dealt with."

– Roy Haiyupis, Ahousaht (Nuu-chah-nulth, 1995, p. 172)

Our Relationship with Ourselves

Each person is born sacred and complete.

"We must redefine and redevelop our profile of what our child is: He is not something to develop the economy. He is a spirit."

– Wes Fineday, Regina, Saskatchewan

Omâmawi Ohtâwîmâw (the Creator) has given each person the gift of a body and the choice to care for and use that body with respect.

Omâmawi Ohtâwîmâw (the Creator) has given each person the capacity and choice to learn.

"I had no schooling. When I was a kid, I used to watch people steadily. I would go to my Grandmother and she told me what rules to follow."

– Vernon Makokis, Saddle Lake, Alberta

"We never force anybody because we are not supposed to do that. We just share and if that person wants to learn more then that person just keeps coming back to Elders to find out the importance of spiritual identity. We have to try to be good all the time."

– Walter Linklator, Anishanabe, Thunderchild First Nation (Saskatchewan Indian Cultural Centre, http://www.sicc.sk.ca/cgi-bin/sicc/epage.pl?161)

"In our system of education, knowledge is earned. One learns to listen, like a human being who has the gift to hear what is said. We don't put knowledge in a person's head or hand. We give directions, not answers. We don't trap people into thinking answers are given from the outside. Answers come from the inside."

– Wes Fineday, Regina, Saskatchewan

"Here are some things for young people to use. Do what an Elder tells you and at the same time, develop your own understanding and follow that."

– Maggie Okanee, Born 1876, Deceased, Cree, Turtle Lake First Nation (Saskatchewan Indian Cultural Centre, http://www.sicc.sk.ca/cgi-bin/sicc/epage.pl?93)

Omâmawi Ohtâwîmâw (the Creator) has given each person talents or strengths to be discovered and the choice to develop and share the gifts.

"The people had carefully organized themselves according to their knowledge, wisdom and abilities.... The men had many abilities; some were canoe builders, carpenters, and weather predictors. Often each man possessed several abilities, which old people call 'gifts.'"

– Andrew Evans, Norway House, Manitoba (Apetagon, Vol. II, 1992, p. 8)

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RATIONALE FOR LEARNING CREE (*NEHIYAWEWIN*)

Elders say that English is a "borrowed" language (*eh awîkawîyahk*), while Cree (*Nehiyawewin ekîmiy'kôwisiyahk*) is a gift of *Omâmawi Ohtâwîmâw* (the Creator). Elders are the keepers of the language and, consequently, of the beliefs and culture. Indeed, language and culture are inextricably woven.

The importance of learning Cree was made clear when the developers of this curriculum met with Elders Joe P. Cardinal, Jenny Cardinal, Linda Oldpan, Alfred Bonaise and Jerry Saddleback. Alfred Bonaise referred to the development of this curriculum as an example of keeping the "flame of language" alive. That flame, the Elders believe, has to be nurtured into a fire of language learning for students. Linda Oldpan, Joe Cardinal and Jenny Cardinal stressed that although this curriculum reflects an "urban perspective," the students need to somehow connect with *Kikâwînaw Askiy* (Mother Earth) and with their lands and families of origin. All of the Elders expressed the need for this curriculum to reflect the connection to *Omâmawi Ohtâwîmâw* (the Creator).

The importance of Cree language learning has also been expressed by Dr. Anne Anderson, who states in the forewords to her Métis Cree resource books that the way to a people's heart is through their language.

Over 80 000 people in Canada speak Cree. It is one of the most widely spoken languages in Canada in various dialects. There are also reservations in the United States of America that have Cree-speaking populations.

The value of learning Cree (*Nehiyawewin*), to Aboriginal and non-Aboriginal students, is enormous. It permits insights into a worldview of spiritual and natural dimensions. When one speaks the language, Elders and their wisdom become accessible. The learning of the Cree language also enhances one's self-esteem by strengthening cultural identity. Use of language is also the best means of transmitting culture to the next generation.

"With the loss of our language, we lose everything.... We must keep our language. With it come the teachings of the old ones and it's the only thing that will preserve what is truly Indian.... Our future as a people doesn't look too good.... Tell the young people they must learn and keep their language...."

– Maggie Francheater, Sunchild Band (Alberta Education, 1990, p. vii)

NATURE OF THE CREE LANGUAGE

The Cree language, or *Nehiyawewin*, is one of many indigenous languages within the Algonkian family of languages. The Cree "Y" dialect that is used in this program of studies is one of the five major dialects in Canada. Cree is a language of relationships—relationships to *Omâmawi Ohtâwîmâw* (the Creator), to others (kinship) and to *Kikâwînaw Askiy* (Mother Earth), which encompasses all living things. It is a rich and complex language because it relates to kinship, nature and spirituality.

The Roman orthography recommended for the instruction of Cree is the Pentland orthography, which is based on the Cree syllabics of standard orthography. The "Y" dialects of the Plains and Woodland Cree of Alberta use 14 English letters, of which 8 are consonants (c, k, m, n, p, s, t and h), 3 are short vowels (a, i, o), 4 are long vowels (a, i, o, e), and "w" and "y" are listed as semi-vowels. A sound variation occurs within the same dialect based on regional and cultural differences.

CONCEPTUAL MODEL

Two curriculum frameworks developed under the Western Canadian Protocol for Collaboration in Basic Education—*The Common Curriculum Framework for Aboriginal Language and Culture Programs, Kindergarten to Grade 12*, June 2000, and *The Common Curriculum Framework for International Languages, Kindergarten to Grade 12*, June 2000—have provided guidance in the development of the Cree Language and Culture 10-6Y, 20-6Y, 30-6Y Program of Studies.

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The aim of this Cree language and culture program of studies is the development of communicative competence and cultural knowledge, skills and values in Cree. It is important that the focus of this program of studies be on interaction and meaningfulness, with special attention and emphasis being given to oral communication.

Four Components

For the purposes of this program of studies, communicative competence and the development of cultural knowledge, skills and values in Cree are represented by four interrelated and interdependent components.

Applications deal with what the students will be able to do with the language, the functions they will be able to perform and the contexts in which they will be able to operate.

Language Competence addresses the students' knowledge of the language and their ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used.

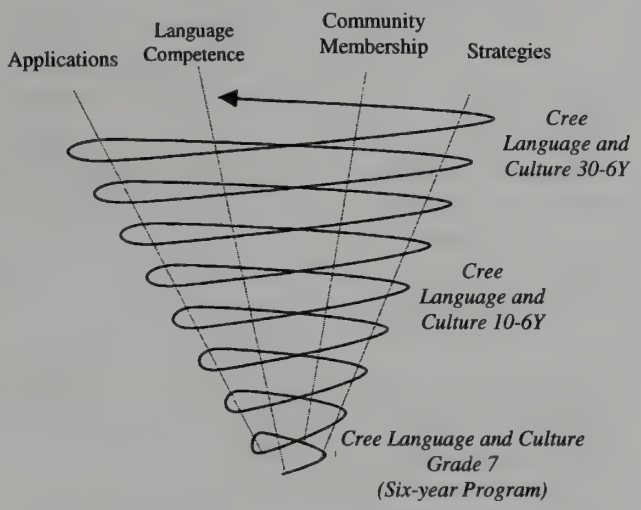
Community Membership aims to develop the understandings, views and values of Cree culture.

Strategies help students learn and communicate more effectively and more proficiently.

Each of these components is described more fully at the beginning of the corresponding section of this program of studies.

A Spiral Progression

Language learning and cultural teachings are integrative, not merely cumulative. Each new element that is added must be integrated into the whole of what has gone before. The model that best represents the students' language and cultural learning progress is an expanding spiral. Students' progression is not only vertical (e.g., increased proficiency), but also horizontal (e.g., broader range of applications and experience with more text forms, contexts and so on). The spiral also represents how language and cultural learning activities are best structured. Particular lexical fields, learning strategies or language functions are revisited at different points in the program, but from a different perspective, in broader contexts or at a slightly higher level of proficiency each time. Learning is reinforced, extended and broadened with each successive pass.



ORGANIZATION OF THE PROGRAM OF STUDIES

General Outcomes

General outcomes are broad statements identifying the knowledge, skills and attitudes that students are expected to achieve in the course of their language learning experience. Four general outcomes serve as the foundation for this program of studies and are based on the conceptual model outlined previously.

Applications [A]

- Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

Language Competence [LC]

- Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

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Community Membership [CM]

- Students will live (*wa*)*wetina*(*hk*) (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

Strategies [S]

- Students will use strategies to maximize learning and communication.

The order in which the general outcomes are presented in this program of studies does not represent a sequential order, nor does it indicate the relative importance of each component. The general outcomes are to be implemented in an integrated manner.

Specific Outcomes

Each general outcome is further broken down into specific outcomes that students are to achieve by the end of each course. The specific outcomes are interrelated and interdependent. In most classroom activities, a number of learning outcomes are addressed in an integrated manner.

The specific outcomes are categorized under cluster headings, which show the scope of each of the four general outcomes. These headings are shown in the table on the following page.

The specific outcomes are further categorized by strands, which show the developmental flow of learning from the beginning to the end of the program. However, a learning outcome for a particular course will not be dealt with only in that particular year of the program. The spiral progression that is part of the conceptual model means that activities in the years preceding will prepare the ground for acquisition and in the years following will broaden applications.

★ discretionary (see further details on p. 28)

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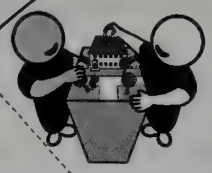
General Outcomes

Applications

Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

A–1 to share information
A–2 to express emotions and personal perspectives
A–3 to get things done
A–4 to form, maintain and change interpersonal relationships
A–5 to enhance their knowledge of the world
A–6 for imaginative purposes and personal enjoyment



Language Competence

Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–1 attend to the form of the language
LC–2 interpret and produce oral texts
LC–3 interpret and produce written and visual texts
LC–4 apply knowledge of the sociocultural context
LC–5 apply knowledge of how the language is organized, structured and sequenced

Strategies

Students will use strategies to maximize learning and communication.

S–1 language learning
S–2 language use
S–3 cultural learning
S–4 general learning

Community Membership

Students will live (*wa*)*wetina*(*hk*) (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

CM–1 *Kikâwînaw Askiy* (Mother Earth★)
CM–2 others
CM–3 themselves

★ discretionary (see further details on p. 28)

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Guide to Reading the Program of Studies

General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers.
(*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

cluster heading for specific outcomes

LC–2 interpret and produce oral texts

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
LC–2.1 listening	a. understand short, simple oral texts in guided and unguided situations	a. understand a variety of short oral texts on unfamiliar topics in guided situations	a. understand the main point and some supporting details of lengthy oral texts on familiar topics in guided situations
LC–2.2 speaking	a. produce short, simple oral texts in guided and unguided situations	a. produce a variety of short, simple oral texts in guided and unguided situations	a. produce short oral texts on unfamiliar topics in guided situations
LC–2.3 interactive fluency	a. manage short interactions with ease	a. manage simple, routine interactions with ease, asking for clarification when necessary	a. manage simple, routine interactions with ease, with pauses to formulate oral text, and self-correct

read each page vertically for the outcomes expected at the end of each course

strand headings for specific outcomes

specific outcome statements for each course

read each page horizontally for the developmental flow of outcomes from course to course

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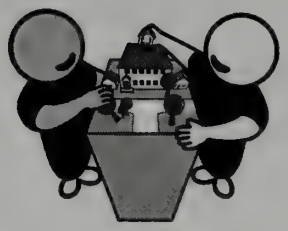

Applications

to express emotions
and personal perspectives

to share
information

to get things done

Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

to form, maintain and
change interpersonal
relationships

for imaginative purposes
and personal enjoyment

to enhance their
knowledge of the world

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APPLICATIONS

The specific outcomes under the heading Applications deal with **what** the students will be able to do with the language; that is, the **functions** they will be able to perform and the **contexts** in which they will be able to operate.

The functions are grouped under six cluster headings—see the illustration on the preceding page. Under each of these headings there are one or more strands that show the developmental flow of learning from course to course. Each strand, identified by a strand heading at the left end of a row, deals with a specific language function; e.g., share factual information. Students at any grade level will be able to share factual information. Beginning learners will do this in very simple ways. As students gain more knowledge and experience, they will broaden the range of subjects they can deal with, they will learn to share information in writing as well as orally, and they will be able to handle formal and informal situations.

The level of linguistic, sociolinguistic and discourse competence that students will exhibit when carrying out the functions is defined in the specific outcomes for Language Competence for each course. To know how well students will be able to perform the specific function, the Applications outcomes must be read in conjunction with the Language Competence outcomes.

It is important that the focus of the Applications component be on interaction and meaningfulness, with special attention and emphasis being given to oral communication.

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General Outcome for Applications
Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

A–1 to share information

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
A–1.1 share factual information	a. provide information on several aspects of a topic b. understand and use comparisons and examples	a. share facts about past, present and future events	a. share detailed information on a specific topic

A–2 to express emotions and personal perspectives

	Students will be able to:		
A–2.1 share ideas, thoughts, preferences	a. inquire about and express agreement and disagreement, approval and disapproval, satisfaction and dissatisfaction, and interest and lack of interest	a. inquire about and express probability, possibility and certainty	a. express and support their own opinions
A–2.2 share emotions, feelings	a. inquire about and express emotions and feelings in a variety of familiar situations b. compare the expression of emotions and feelings in a variety of informal situations	a. express emotions and feelings in formal situations	a. compare the expression of emotions and feelings in formal and informal situations

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General Outcome for Applications
Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

A–3 to get things done

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
A–3.1 guide actions of others	a. make and respond to suggestions in a variety of situations b. give, follow and respond to advice and warnings	a. make and respond to suggestions or requests in community situations	a. express concerns and suggest a solution
A–3.2 state personal actions	a. state personal actions in the past, present and future b. learn about consequences in a variety of situations	a. accept or decline an offer or an invitation, with simple explanations	a. express consequences in relation to their own actions
A–3.3 manage group actions	a. check for agreement and understanding b. express disagreement in an appropriate way c. express appreciation, enthusiasm, support and respect for contributions of others	a. paraphrase, elaborate on and clarify another member's contribution	a. contribute effectively in small-group projects

A–4 to form, maintain and change interpersonal relationships

	Students will be able to:		
A–4.1 manage personal relationships	a. make and break social engagements b. use routine means of interpersonal communications	a. give and respond appropriately to compliments	a. offer and respond to congratulations, and express regret

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General Outcome for Applications
Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

A–5 to enhance their knowledge of the world

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
A–5.1 discover and explore	a. explore classification systems and criteria for categories b. explore meaning in what they are doing	a. explore and express the meaning of what they are doing	a. explore connections among, and gain new insights into, familiar topics
A–5.2 gather and organize information	a. compose questions to guide research b. identify sources of information and record observations c. gather information, using a prepared format	a. organize and prepare information, using a variety of techniques	a. share key ideas, summarize and paraphrase
A–5.3 solve problems	a. reflect upon and discuss problem-solving experiences, stories and legends	a. identify potential problems and their potential consequences	a. search for possible ways to solve problems
A–5.4 explore perspectives and values	a. gather thoughts, ideas and opinions on a topic within their own experience b. explore how Cree worldview and values influence personal behaviour and choices	a. understand how Cree views and values influence their own and others' behaviour and choices	a. provide information and reasons for their ideas and thoughts on an issue or a topic

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General Outcome for Applications
Students will use and apply Cree in various situations and for different purposes at home, in school and in the community.

A–6 for imaginative purposes and personal enjoyment

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
A–6.1 humour/fun	a. use the language for fun and to interpret humour; e.g., play a variety of sports and games, both indoors and out	a. use the language for fun and to interpret and express humour; e.g., learn and perform songs, dances, short plays	a. use the language for fun and to interpret and express humour; e.g., participate in class excursions, field trips, twinning projects
A–6.2 creative/aesthetic purposes	a. use the language creatively and for aesthetic purposes; e.g., write new words to a known melody, create a round dance song	a. use the language creatively and for aesthetic purposes; e.g., create and perform a skit	a. use the language creatively and for aesthetic purposes; e.g., create a multimedia production on a familiar topic
A–6.3 personal enjoyment	a. use the language for personal enjoyment; e.g., find a personal pen pal and exchange letters	a. use the language for personal enjoyment; e.g., use the Internet to explore Cree culture and Elders in the community	a. use the language for personal enjoyment; e.g., use the Internet to explore Cree culture

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Language Competence

interpret and produce oral texts

attend to the form of the language

interpret and produce written and visual texts

Students will be effective, competent and comfortable as Cree speakers.
(*Okiskinamawâkanak ka/ta nihtâ nehiyawewak*.)

apply knowledge of the sociocultural context

apply knowledge of how the language is organized, structured and sequenced

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LANGUAGE COMPETENCE

Language competence is a broad term that includes linguistic or grammatical competence, discourse competence, sociolinguistic or sociocultural competence and what might be called textual competence. The specific outcomes under Language Competence deal with knowledge of the Cree language and the ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used. Language competence is best developed in the context of activities or tasks in which the language is used for real purposes—in other words, in practical **applications**.

The various components of language competence are grouped under five cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of language competence. For example, under the cluster heading "attend to the form of the language," there are strands for phonology (pronunciation, stress, intonation), orthography (spelling, mechanical features), lexicon (vocabulary words and phrases) and grammatical elements (syntax and morphology).

Although the outcomes isolate these individual aspects, language competence should be developed through classroom activities that focus on meaningful uses of the Cree language and on **language in context**. Tasks will be chosen based on the needs, interests and experiences of students. The vocabulary, grammar structures, text forms and social conventions necessary to carry out a task will be taught, practised and assessed as students are involved in various aspects of the task itself, **not in isolation**.

Strategic competence is often closely associated with language competence, since students need to learn ways to compensate for low proficiency in the early stages of learning if they are to engage in authentic language use from the beginning. This component is included in the language use strategies in the Strategies section.

It is important that the focus of the Language Competence component be on interaction and meaningfulness, with special attention and emphasis being given to oral communication.

Note: The following abbreviations are used in the grammatical elements section, under the cluster heading "attend to the form of the language":

NA	Animate noun
NI	Inanimate noun
1S	First person singular
2S	Second person singular
3S	Third person singular
1P	First person plural
2I	Second person inclusive
2P	Second person plural
3P	Third person plural

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–1 attend to the form of the language

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
LC–1.1 phonology	a. enunciate unfamiliar words independently and confidently	a. use intonation, stress and rhythm appropriately in familiar situations	a. speak clearly and intelligibly in a variety of situations
LC–1.2 orthography	a. use a syllabics chart to produce simple written words and phrases b. use basic spelling patterns and mechanical conventions used in the local community	a. use a syllabics chart to produce written sentences and short written texts b. apply basic spelling patterns consistently in writing familiar words	a. use a syllabics chart to produce written texts b. apply spelling rules and writing consistently and accurately
LC–1.3 lexicon	a. use a repertoire of words and phrases (vocabulary) in familiar contexts, within a variety of lexical fields, including: • world of work • living things • shopping and fashion • extracurricular activities • plants and seasons • entertainment • other Aboriginal communities • peers and friendship • cooking • any other lexical fields that meet their needs and interests	a. use a repertoire of words and phrases (vocabulary) in familiar contexts, within a variety of lexical fields, including: • family traditions • healthy living • our land • arts and crafts • going out • any other lexical fields that meet their needs and interests	a. use a repertoire of words and phrases (vocabulary) in familiar contexts, within a variety of lexical fields, including: • trades and professions • community service/ volunteerism • peoples that make up Canada • safety • nature • any other lexical fields that meet their needs and interests

(continued)

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

(continued)

LC–1 attend to the form of the language

Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y

Students will be able to:

a. use, in modelled situations,[1] the following grammatical elements: .....

LC–1.4 grammatical elements

Possessive Pronouns (NA)
nikâwîyinân
kikâwîyinaw
kikâwîyiwâw
okâwîyiwâwa
okâwîyiyiwa
nîtisâninânak
kîtisâninawak
kîtisâniwâwak
wîtisâniwâwa
wîtisâniyiwa

Possessive Pronouns (NI)
nimaskisininân
kimaskisinaw
kimaskisiniwâw
omaskisiniwâw
omaskisiniyiw
nîkinân
kîkinaw
kîkiwâw
wîkiwâw
wîkiyiw

Personal Pronouns (Plural)
1P *nîyanân*
2I *kîyânaw*
2P *kîyawâw*
3P *wîyawâw*

Emphatic Agreements (Plurals)
2I *kîstanaw*

Personal Pronouns (Plural)
2P *kîyawâw*

(continued)

1. Modelled Situations: This term is used to describe learning situations where a model of specific linguistic elements is consistently provided and immediately available. Students in such situations will have an emerging awareness of the linguistic elements and will be able to apply them in very limited situations. Limited fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

(continued)

LC–1 attend to the form of the language

Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y

Students will be able to:

b. use, in structured situations,[2] the following grammatical elements: .....

LC–1.4 grammatical elements

Personal Pronouns (Singular)
Emphatic agreement
nîsta
kîsta
wîsta
1S *nîya* (I)
2S *kîya* (you)
3S *wîya* (she/he)

Demonstrative Pronouns
awa (this is – NA)
ôma (this is – NI)
ôki (NA) *aniki* (NA)
ôhi (NI) *anihi* (NI)

Possessive Pronouns (NI)
nimaskisin, kimaskisin, omaskisin
nîki, kîki, wîki

Possessive Pronouns (NA)
nikâwîy, kikâwîy, okâwiya, nîtisânak, kîtisânak, wîtisâna

Emphatic Agreements (Plurals)
1P *nîstanân*
2I *kîstanaw*
2P *kîstawâw*
3P *wîstawâw*

Emphatic Agreements (Plurals)
1P *nîstanân*
2I *kîstanaw*
2P *kîstawâw*
3P *wîstawâw*

Personal Pronouns (Plural)
1P *nîyanân*
2I *kîyânaw*
2P *kîyawâw*
3P *wîyawâw*

Possessive Pronouns (NA)
nikâwîyinân
kikâwîyinaw
kikâwîyiwâw
okâwîyiwâwa
okâwîyiyiwa
nîtisâninânak
kîtisâninawak
kîtisâniwâwak
wîtisâniwâwa
wîtisâniyiwa

Possessive Pronouns (NI)
nimaskisininân
kimaskisinaw
kimaskisiniwâw
omaskisiniwâw
omaskisiniyiw
nîkinân
kîkinaw
kîkiwâw
wîkiwâw
wîkiyiw

Personal Pronouns (Plural)
2P *kîyawâw*

Emphatic Agreements (Plurals)
2I *kîstanaw*

Possessive Pronouns (NA)
nikâwîyinân
kikâwîyinaw
kikâwîyiwâw
okâwîyiwâwa
okâwîyiyiwa
nîtisâninânak
kîtisâninawak
kîtisâniwâwak
wîtisâniwâwa
wîtisâniyiwa

Possessive Pronouns (NI)
nimaskisininân
kimaskisinaw
kimaskisiniwâw
omaskisiniwâw
omaskisiniyiw
nîkinân
kîkinaw
kîkiwâw
wîkiwâw
wîkiyiw

(continued)

2. Structured Situations: This term is used to describe learning situations where a familiar context for the use of specific linguistic elements is provided and students are guided in the use of these linguistic elements. Students in such situations will have increased awareness and emerging control of the linguistic elements and will be able to apply them in familiar contexts with teacher guidance. Student language is characterized by increasing fluency and confidence.

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

(continued)

LC–1 attend to the form of the language

Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y

Students will be able to:

c. use, independently and consistently,[3] the following grammatical elements: .....

LC–1.4 grammatical elements

Interrogatives
tân'sîysi/tân'sîsi (how)
tânehki/tânîhki (why)

Demonstrative Pronouns
anima/nema (NI)
ana/nâha (NA)

Demonstrative Pronouns
awa (this is – NA)
ôma (this is – NI)
ôki (NA) *aniki* (NA)
ôhi (NI) *anihi* (NI)

Possessive Pronouns (NI)
nimaskisin, kimaskisin, omaskisin
nîki, kîki, wîki

Possessive Pronouns (NA)
nikâwîy, kikâwîy, okâwiya,
nîtisânak, kîtisânak, wîtisâna

Personal Pronouns (Plural)
1P *nîyanân*
2I *kîyânaw*
2P *kîyawâw*
3P *wîyawâw*

Emphatic Agreements (Plurals)
1P *nîstanân*
2I *kîstanaw*
2P *kîstawâw*
3P *wîstawâw*

3. Independently and Consistently: This term is used to describe learning situations where students use specific linguistic elements consistently in a variety of contexts with limited or no teacher guidance. Fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–2 interpret and produce oral texts

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
LC–2.1 listening	a. understand short, simple oral texts in guided and unguided situations	a. understand a variety of short oral texts on unfamiliar topics in guided situations	a. understand the main point and some supporting details of lengthy oral texts on familiar topics in guided situations
LC–2.2 speaking	a. produce short, simple oral texts in guided and unguided situations	a. produce a variety of short, simple oral texts in guided and unguided situations	a. produce short oral texts on unfamiliar topics in guided situations
LC–2.3 interactive fluency	a. manage short interactions with ease	a. manage simple, routine interactions with ease, asking for clarification when necessary	a. manage simple, routine interactions with ease, with pauses to formulate oral text, and self-correct

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–3 interpret and produce written and visual texts

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
LC–3.1 reading	a. understand short, simple written texts in guided and unguided situations	a. understand short written texts on unfamiliar topics in guided situations	a. understand the main point and some supporting details of lengthy written texts on familiar topics in guided situations
LC–3.2 writing	a. produce short, simple written texts in guided and unguided situations	a. produce a variety of short, simple written texts in guided and unguided situations	a. produce short written texts on unfamiliar topics in guided situations
LC–3.3 viewing	a. derive meaning from multiple visual elements in a variety of media in guided situations	a. derive meaning from multiple visual elements in a variety of media in guided and unguided situations	a. propose several interpretations of the visual elements of a variety of media in guided situations
LC–3.4 representing	a. express meaning through the use of multiple visual elements in a variety of media, in guided situations	a. express meaning through the use of multiple visual elements in a variety of media, in guided and unguided situations	a. explore a variety of ways that meaning can be expressed through the visual elements of a variety of media, in guided situations

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–4 apply knowledge of the sociocultural context

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
LC–4.1 register	a. explore formal and informal language and behaviours in a variety of contexts	a. use suitable, simple formal language in a variety of contexts	a. explore differences in register between spoken and written texts
LC–4.2 expressions	a. use learned expressions in a variety of contexts	a. explore the use of expressions in cultural contexts	a. identify influences on expressions
LC–4.3 variations in language	a. recognize other influences resulting in variations in language	a. recognize other influences resulting in variations in language	a. recognize other influences resulting in variations in language
LC–4.4 social conventions	a. interpret the use of social conventions encountered in oral and written texts	a. interpret and use important social conventions in interactions	a. interpret and use appropriate oral and written forms of address with a variety of audiences
LC–4.5 nonverbal communication	a. recognize that some nonverbal behaviours may be inappropriate in certain contexts b. recognize nonverbal behaviours that are considered impolite	a. avoid nonverbal behaviours that are considered impolite	a. recognize various types of nonverbal communication

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General Outcome for Language Competence
Students will be effective, competent and comfortable as Cree speakers. (*Okiskinamawâkanak ka/ta nihtâ nehiyawewak.*)

LC–5 apply knowledge of how the language is organized, structured and sequenced

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
LC–5.1 cohesion/ coherence	a. organize texts, using common patterns b. interpret simple references within texts	a. use a variety of conventions to structure texts; e.g., titles, poetry and riddle forms b. use a variety of patterns in their own texts	a. use simple references within texts
LC–5.2 text forms	a. recognize a variety of text forms delivered through a variety of media b. analyze and identify the organizational structure of a variety of text forms; e.g., legends	a. use a variety of familiar text forms and media in their own productions	a. use a variety of familiar text forms and media in their own productions
LC–5.3 patterns of social interaction	a. initiate interactions and respond, using a variety of social interaction patterns	a. combine simple social interaction patterns to perform transactions and interactions	a. combine simple social interaction patterns to perform complex transactions and interactions

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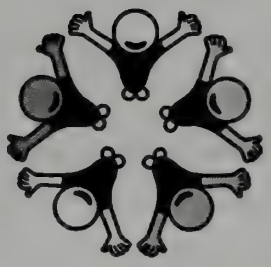

Community Membership

Kikâwînaw Askiy
(Mother Earth★)

others

Students will live (*wa*)*wetina*(*hk*) (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

themselves

★ discretionary (see further details on p. 28)

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COMMUNITY MEMBERSHIP

The specific outcomes in the Community Membership section are intended to support many aspects of the students' Cree cultural development. These outcomes are grouped under three cluster headings—see the illustration on the preceding page. Each cluster is further broken down into five strands, each of which strives to build a specific knowledge, skill or value from Grade 7 to Grade 12. The five strands are as follows:

- relationships
- knowledge of past and present
- practices and products
- past and present perspectives
- diversity.

The terms "Mother Earth" and "Creator" are identified as discretionary terms in this program of studies. Communities may choose to use these terms or to use other related terms acceptable to them (e.g., nature, the environment) in order to teach the outcomes in this section.

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General Outcome for Community Membership
Students will live (*wa*)*wetina*(*hk*) (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

CM–1 *Kikâwînaw Askiy* (Mother Earth★)

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
CM–1.1 relationships	a. demonstrate leadership in caring for and respecting *Kikâwînaw Askiy* (Mother Earth★) b. examine their own treatment of, and attitudes toward, *Kikâwînaw Askiy* (Mother Earth★)	a. examine their own treatment of, and attitudes toward, *Kikâwînaw Askiy* (Mother Earth★)	a. examine community and societal treatment of, and attitudes toward, *Kikâwînaw Askiy* (Mother Earth★)
CM–1.2 knowledge of past and present	a. identify and describe basic facts about some Cree geographical regions or communities b. explore and examine *Kikâwînaw Askiy* (Mother Earth★)	a. examine and identify changes that have occurred in their own community/land	a. examine and identify changes in other Cree communities
CM–1.3 practices and products	a. identify and describe basic practices and products related to *Kikâwînaw Askiy* (Mother Earth★) b. explore the significance of practices and products related to *Kikâwînaw Askiy* (Mother Earth★)	a. understand the meaning and significance of some practices and products related to *Kikâwînaw Askiy* (Mother Earth★)	a. understand the meaning and significance of a variety of practices and products related to *Kikâwînaw Askiy* (Mother Earth★)
CM–1.4 past and present perspectives	a. identify and examine traditional Cree perspectives and values related to *Kikâwînaw Askiy* (Mother Earth★) b. examine their own perspectives, opinions and views related to *Kikâwînaw Askiy* (Mother Earth★)	a. understand the meaning and significance of some practices and products	a. explore a variety of perspectives related to the treatment of *Kikâwînaw Askiy* (Mother Earth★)

(continued)

★ discretionary (see further details on p. 28)

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General Outcome for Community Membership
Students will live (*wa*)*wetina*(*hk*) (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

(continued)

CM–1 *Kikâwînaw Askiy* (Mother Earth★)

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
CM–1.5 diversity	a. identify and examine diverse Cree perspectives and values related to *Kikâwînaw Askiy* (Mother Earth★) b. examine diverse perspectives, opinions and views related to *Kikâwînaw Askiy* (Mother Earth★)	a. examine and compare diverse perspectives, opinions and views related to *Kikâwînaw Askiy* (Mother Earth★)	a. explore a variety of perspectives related to *Kikâwînaw Askiy* (Mother Earth★)

★ discretionary (see further details on p. 28)

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General Outcome for Community Membership
Students will live (*wa*)*wetina*(*hk*) (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

CM–2 others

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
CM–2.1 relationships	a. form meaningful/special relationships with others; e.g., girl-aunt relationships, joking relationships, same name b. form and maintain authentic, respectful relationships with others; e.g., opposite sex	a. accept and value differences in group and individual settings and appreciate the skills and talents of others	a. participate in creating consensus while working with others and encourage and help others
CM–2.2 knowledge of past and present	a. explore key Cree historical and contemporary events, figures and developments; e.g., treaties, Big Bear, residential schools, Elijah Harper, Louis Riel	a. identify key Cree historical and contemporary events, figures and developments; e.g., leadership styles, local government and reserve system	a. identify key Cree historical and contemporary events, figures and developments; e.g., government styles
CM–2.3 practices and products	a. identify and describe key Cree cultural practices and products b. explore the significance of Cree cultural practices and products	a. understand the meaning and significance of some Cree cultural practices and products	a. understand the meaning and significance of a variety of Cree cultural practices and products
CM–2.4 past and present perspectives	a. identify and explore past and present perspectives and values, and celebrate change b. explore and identify basic Cree perspectives and values	a. examine basic Cree perspectives and values	a. explore traditional and contemporary Cree perspectives and values
CM–2.5 diversity	a. explore Cree-speaking cultural groups as part of larger Aboriginal communities b. appreciate and respect similarities and differences in others	a. identify and discuss similarities and differences in others and examine stereotyping	a. examine and discuss similarities and differences in others and examine stereotyping

★ discretionary (see further details on p. 28)

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General Outcome for Community Membership
Students will live (*wa*)*wetina*(*hk*) (peacefully) with *Kikâwînaw Askiy* (Mother Earth★), others and themselves, guided by *Omâmawi Ohtâwîmâw* (the Creator★).

CM–3 themselves

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
CM–3.1 relationships	a. reflect on various facets of self-identity b. understand self-concept and the factors that may affect it and understand the importance of developing a positive self-concept and self-identity	a. examine their identity and reflect on its possible effect on personal relationships and choices	a. understand self-concept and its relationship to overall development, achievement and decisions for the future
CM–3.2 knowledge of past and present	a. explore and examine their own cultural heritage	a. examine and identify changes that have occurred in their own specific culture	a. reflect on how their knowledge of their own cultural heritage helps them to understand themselves better
CM–3.3 practices and products	a. explore and identify Cree cultural experiences, practices and products b. explore the personal significance of Cree cultural practices and products	a. understand the meaning and significance of some Cree cultural practices and products	a. understand the meaning and significance of a variety of Cree cultural practices and products
CM–3.4 past and present perspectives	a. recognize the effects, on themselves, of positive and negative treatment; i.e., stereotyping b. explore changing perspectives of themselves (cultural, language, family, roles) and examine stereotyping	a. explore changing perspectives of themselves (peer groups, social environments) and examine stereotyping	a. explore the significance, to themselves, of the Cree culture
CM–3.5 diversity	a. explore, examine and celebrate their own unique cultural heritage	a. examine and celebrate changes in their own perspectives about Cree culture	a. identify and celebrate their knowledge of their own cultural heritage

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Strategies

language learning

language use

Students will use strategies to maximize learning and communication.

cultural learning

general learning

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STRATEGIES

Under the Strategies heading are specific outcomes that will help students learn and communicate more **effectively**. Strategic competence has long been recognized as an important component of communicative competence. The learning outcomes that follow deal not only with compensation and repair strategies, important in the early stages of language learning when proficiency is low, but with strategies for language learning, language use in a broader sense and cultural learning, and with general learning strategies that help students acquire content. Although people may use strategies unconsciously, the learning outcomes deal only with the **conscious use** of strategies.

The strategies are grouped under four cluster headings—see the illustration on the preceding page. For the Strategies component, the strands mirror the cluster headings. Each cluster heading or strand deals with a specific category of strategy. Language learning, cultural learning and general learning strategies can be further categorized as cognitive, metacognitive and social/affective. The language use strategies can be further categorized by communicative mode: interactive, interpretive, productive.

The strategies that students choose depend on the task they are engaged in as well as on other factors, such as their preferred learning style, personality, age, attitude and cultural background. Strategies that work well for one person may not be effective for another person, or may not be suitable in a different situation. For this reason, it is not particularly useful to say that students should be aware of, or able to use, a specific strategy in a particular course. Consequently, the specific outcomes make only general references to strategies within each category. Specific strategies for each category are included in the sample list of strategies below. The specific strategies provided in the sample list **are not prescriptive** but are provided as an illustration of how the general strategies in the specific outcomes might be developed.

Teachers need to know and model a broad range of strategies from which students are then able to choose in order to communicate effectively. Strategies of all kinds are best taught in the context of learning activities where students can apply them immediately and then reflect on their use.

SAMPLE LIST OF STRATEGIES

Language Learning Strategies

Cognitive

- listen attentively
- perform actions to match the words of a song, story or rhyme
- learn short rhymes or songs, incorporating new vocabulary or sentence patterns
- imitate sounds and intonation patterns
- memorize new words by repeating them silently or aloud
- seek the precise term to express meaning
- repeat words or phrases in the course of performing a language task
- make personal dictionaries
- experiment with various elements of the language
- use mental images to remember new information
- group together sets of things—vocabulary, structures—with similar characteristics
- identify similarities and differences between aspects of the Cree language and English
- look for patterns and relationships
- use previously acquired knowledge to facilitate a learning task
- associate new words or expressions with familiar ones, either in Cree or in English
- find information, using reference materials such as dictionaries, textbooks and grammars
- use available technological aids to support language learning; e.g., cassette recorders, computers, CD–ROMs
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember
- place new words or expressions in a context to make them easier to remember

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- use induction to generate rules governing language use
- seek opportunities in and outside of class to practise and observe
- perceive and note down unknown words and expressions, noting also their context and function

Metacognitive
- check copied writing for accuracy
- make choices about how you learn
- rehearse or role-play language
- decide in advance to attend to the learning task
- reflect on learning tasks with the guidance of the teacher
- make a plan in advance about how to approach a language learning task
- reflect on the listening, speaking, reading and writing process
- decide in advance to attend to specific aspects of input
- listen or read for key words
- evaluate your performance or comprehension at the end of a task
- keep a learning checklist
- experience various methods of language acquisition, and identify one or more considered to be particularly useful personally
- be aware of the potential of learning through direct exposure to the language
- know how strategies may enable coping with texts containing unknown elements
- identify problems that might hinder successful completion of a task, and seek solutions
- monitor your speech and writing to check for persistent errors
- be aware of your strengths and weaknesses, identify your needs and goals, and organize strategies and procedures accordingly

Social/Affective
- initiate or maintain interaction with others
- participate in shared reading experiences
- seek the assistance of a friend to interpret a text
- reread familiar self-chosen texts to enhance understanding and enjoyment
- work cooperatively with peers in small groups
- understand that making mistakes is a natural part of language learning
- experiment with various forms of expression, and note their acceptance or nonacceptance by more experienced speakers
- participate actively in brainstorming and conferencing as prewriting and postwriting exercises
- use self-talk to feel competent to do the task
- be willing to take risks and to try unfamiliar tasks and approaches
- repeat new words and expressions occurring in your conversations, and make use of these new words and expressions as soon as appropriate
- reduce anxiety by using mental techniques, such as positive self-talk or humour
- work with others to solve problems and get feedback on tasks
- provide personal motivation by arranging your own rewards when successful

Language Use Strategies

Interactive
- use English to get meaning across
- use a literal translation of a phrase in English
- use an English word but pronounce it as in Cree
- acknowledge being spoken to with appropriate expression
- interpret and use a variety of nonverbal cues to communicate; e.g., mime, pointing, gestures, pictures
- indicate lack of understanding verbally or nonverbally
- ask for clarification or repetition when you do not understand
- use other speakers' words in subsequent conversations
- assess feedback from a conversation partner to recognize when a message has not been understood; e.g., blank look
- start again, using a different tactic, when communication breaks down
- invite others into the discussion
- ask for confirmation that a form used is correct

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- use a range of fillers, hesitation devices and gambits to sustain conversations
- use circumlocution to compensate for lack of vocabulary

Interpretive
- use gestures, intonation and visual supports to aid comprehension
- make connections between texts on the one hand and prior knowledge and personal experience on the other
- use illustrations to aid reading comprehension
- determine the purpose of listening
- listen or look for key words
- listen selectively based on purpose
- make predictions about what you expect to hear or read based on prior knowledge and personal experience
- use knowledge of the sound–symbol system to aid reading comprehension
- infer probable meanings of unknown words or expressions from contextual clues
- prepare questions or a guide to note down information found in a text
- use key content words or discourse markers to follow an extended text
- reread several times to understand complex ideas
- summarize information gathered
- assess your information needs before listening, viewing or reading
- use skimming and scanning to locate key information in texts

Productive
- mimic what the teacher says
- use nonverbal means to communicate
- copy what others say or write
- use words visible in the immediate environment
- use resources to increase vocabulary
- use familiar repetitive patterns from stories, songs, rhymes or media
- use illustrations to provide detail when producing your own texts
- use knowledge of sentence patterns to form new sentences
- use a variety of resources to correct texts; e.g., personal and commercial dictionaries, checklists, grammars
- take notes when reading or listening to assist in producing your own text
- revise and correct final versions of texts
- use circumlocution and definition to compensate for gaps in vocabulary
- apply grammar rules to improve accuracy at the correction stage
- compensate for avoiding difficult structures by rephrasing

Cultural Learning Strategies

Cognitive
- observe and listen attentively
- actively participate in culturally relevant activities, such as storytelling, ceremonies, berry picking, feasts, fish scale art and sewing
- imitate cultural behaviours
- memorize specific protocols, such as prayers, songs and stories
- seek out information by asking others, such as parents, teachers and Elders
- repeat or practise saying or performing cultural practices or traditions, such as prayers, songs, words and actions
- make/create cultural learning logs
- experiment with, and engage in, various cultural practices and elements
- use mental images to remember new cultural information, such as Teepee Teachings
- group together sets of things—cultural practices, objects—with similar characteristics
- identify similarities and differences between aspects of Cree culture and other cultures to which you have been exposed
- look for patterns and relationships
- use previously acquired knowledge to facilitate cultural learning
- associate new cultural learnings with previous knowledge
- use available technological aids to support cultural learning; e.g., computers, videos/ DVDs, CD–ROMs
- use mind maps, webs or diagrams
- place new cultural learning in a context to make it easier to remember

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- use induction to generate rules governing cultural elements, such as values, traditions, beliefs, practices and relationships
- seek opportunities in and outside of class to practise, observe and participate in cultural activities/elements
- perceive and note down unknown cultural elements and practices

Metacognitive
- make choices about how you learn
- rehearse or role-play a cultural experience
- decide in advance to attend to the cultural learning task
- reflect on cultural learning tasks
- think in advance about how to approach a cultural learning task
- reflect on your learning or inquiries
- decide in advance to attend to specific aspects of a cultural event
- listen for, or observe, key cultural elements
- evaluate your performance or comprehension at the end of a cultural task or activity
- keep a cultural learning/teachings checklist
- experience various methods of learning about culture, and identify one or more considered to be particularly useful personally; e.g., by doing it, observing it, reading about it
- be aware of the potential of learning through direct exposure to the culture
- know how strategies may enable coping with new cultural experiences containing unknown elements
- identify obstacles that might hinder successful participation in cultural experiences, and see ways to overcome these obstacles
- monitor your cultural behaviours and practices
- be aware of your strengths and weaknesses, identify your needs and goals, and organize strategies and processes accordingly

Social/Affective
- initiate and maintain participation in the culture
- participate in shared cultural experiences
- seek the assistance of a friend, teacher, Elder or parent to understand cultural elements
- participate several times in favourite cultural experiences and activities to enhance understanding and enjoyment
- work cooperatively with peers in small groups
- understand that making mistakes is a natural part of learning about culture
- experiment with various cultural behaviours and practices, noting acceptance/support or nonacceptance/lack of support by members of the culture
- participate actively in the traditions of the culture; i.e., storytelling, sharing circle
- be willing to take risks and to try new/unfamiliar things
- apply new cultural learnings as soon as possible after learning/observing them
- reduce anxiety by using mental techniques, such as positive self-talk or humour
- work cooperatively with others, and get feedback on your work
- provide personal motivation by arranging your own rewards when successful

General Learning Strategies

Cognitive
- classify objects and ideas according to their attributes; e.g., red objects and blue objects, or animals that eat meat and animals that eat plants
- use models
- connect what is already known with what is being learned
- experiment with, and concentrate on, one thing at a time
- focus on and complete learning tasks
- record key words and concepts in abbreviated form—verbal, graphic or numerical—to assist with performance of a learning task
- use mental images to remember new information
- distinguish between fact and opinion when using a variety of sources of information
- formulate key questions to guide research
- make inferences, and identify and justify the evidence on which these inferences are based
- use word maps, mind maps, diagrams, charts or other graphic representations to make

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information easier to understand and remember
- seek information through a network of sources, including libraries, the Internet, individuals and agencies
- use previously acquired knowledge or skills to assist with a new learning task

Metacognitive
- reflect on learning tasks with the guidance of the teacher
- choose from among learning options
- discover how your efforts can affect learning
- reflect upon your thinking processes and how you learn
- decide in advance to attend to the learning task
- divide an overall learning task into a number of subtasks
- make a plan in advance about how to approach a task
- identify your needs and interests
- manage your physical working environment
- keep a learning journal, such as a diary or a log
- develop criteria for evaluating your work
- work with others to monitor your learning
- take responsibility for planning, monitoring and evaluating learning experiences

Social/Affective
- watch others' actions and copy them (the actions of Aboriginal students, maybe, more than others)
- seek help from others
- follow your natural curiosity and intrinsic motivation to learn
- participate in cooperative group learning tasks
- choose learning activities that enhance understanding and enjoyment
- be encouraged to try, even though mistakes might be made
- take part in group decision-making processes (consensus)
- use support strategies to help peers persevere at learning tasks; e.g., offer encouragement, praise and ideas
- take part in group problem-solving processes
- use self-talk to feel competent to do the task
- be willing to take risks and to try unfamiliar tasks and approaches
- monitor your level of anxiety about learning tasks, and take measures to lower it if necessary; e.g., deep breathing, laughter
- use social interaction skills to enhance group learning activities

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General Outcome for Strategies
Students will use strategies to maximize learning and communication.

S–1 language learning

	Cree Language and Culture 10-6Y	Cree Language and Culture 20-6Y	Cree Language and Culture 30-6Y
	Students will be able to:		
S–1.1 language learning	a. select and use a variety of strategies to enhance language learning	a. select and use a variety of strategies to enhance language learning	a. select and use appropriate strategies to enhance language learning in a variety of situations

S–2 language use

	Students will be able to:		
S–2.1 language use	a. select and use a variety of strategies to enhance language use	a. select and use a variety of strategies to enhance language use	a. select and use appropriate strategies to enhance language use in a variety of situations

S–3 cultural learning

	Students will be able to:		
S–3.1 cultural learning	a. select and use a variety of strategies to enhance cultural learning	a. select and use a variety of strategies to enhance cultural learning	a. select and use appropriate strategies to enhance cultural learning in a variety of situations

S–4 general learning

	Students will be able to:		
S–4.1 general learning	a. select and use a variety of strategies to enhance general learning	a. select and use a variety of strategies to enhance general learning	a. select and use appropriate strategies to enhance general learning in a variety of situations

Examples of language learning, language use, cultural learning and general learning strategies are available on pages 34 to 38.

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GREEN CERTIFICATE PROGRAM

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GREEN CERTIFICATE PROGRAM

A. PROGRAM RATIONALE AND PHILOSOPHY

RATIONALE

The Green Certificate Program was developed by Alberta Agriculture, Food and Rural Development (AAFRD) as a means of developing human resources for Alberta's agriculture sector.

AAFRD continues to be the primary administrator of the Green Certificate Program and continues to be responsible for determining the performance outcomes for each agricultural specialization. However, through a partnership among Alberta Learning, AAFRD and representatives from each of the specializations, each of the Green Certificate specializations has been restructured and is now available as Alberta Learning approved courses.

Prior to the restructuring, students were able to access Green Certificate training by enrolling in work experience courses.

The new Green Certificate courses enable Alberta senior high school students to earn senior high school credits by enrolling in combinations of courses relating to one of the following specializations:

- Bee Keeper Production
- Cow–Calf Beef Production
- Dairy Production
- Feedlot Beef Production
- Field Crop Production
- Irrigated Field Crop Production
- Sheep Production
- Swine Production.

Like the Registered Apprenticeship Program, each of the Green Certificate specializations provides students with access to the first level of an agricultural apprenticeship. Learners can progress in each specialization through two levels—technician level and supervisor level—and, if their career interests expand to management roles in agriculture, to a generic third level of the Green Certificate, the Farm Manager Program.

Each of the first two levels in each specialization requires approximately 400 hours of on-the-job learning.

The courses constituting this program of studies address the Level 1: Technician component only. Most senior high school students enrolling in and attaining a Green Certificate do so at the technician level. A small number of students may progress to the Level 2: Supervisor program in their selected specialization while still in school. To access Level 2 programs, students may enroll in Work Experience 15–25–35 courses.

Students completing a Level 1 Green Certificate in any of the specializations are awarded the Green Certificate Technician credential, and their Alberta Learning transcript will identify the specific courses completed.

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PHILOSOPHY

The Green Certificate Program provides students with opportunities to enter a variety of agriculture-related, structured learning pathways as a part of their senior high school program and to earn a credential leading to a career in agribusiness.

Students learn on the job, under the direction of experienced farm personnel and under the supervision and administration of AAFRD and Alberta Learning.

The notion of "learner as worker and worker as learner" is becoming increasingly accepted. There is considerable research that supports viewing the workplace as an extension of the school and the school as an extension of the workplace.

Similarly, experiential/applied learning is being increasingly seen as a vehicle for enhancing more formal learning systems, by making other senior high school courses more relevant and meaningful to the learner.

The Green Certificate Program is based on the above research and on the belief that programs delivered off campus contribute to effective learning and the development of closer linkages among the school, the student and the local community.

Within the philosophy of the Green Certificate Program, students enrolled in each specialization will:

- demonstrate general and specific outcomes that enable them to earn a Level 1: Technician credential within their selected specialization
- develop competencies in a selected agricultural specialization
- develop appropriate employability skills
- recognize and develop a positive attitude toward safety and safe workplace practices
- analyze career opportunities in the agricultural industry.

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B. PROGRAM ORGANIZATION AND DELIVERY

PROGRAM ORGANIZATION

The Green Certificate Program currently consists of the eight specializations listed below. AAFRD is, however, currently considering the addition of new specializations.

- Bee Keeper Production
- Cow–Calf Beef Production
- Dairy Production
- Feedlot Beef Production
- Field Crop Production
- Irrigated Field Crop Production
- Sheep Production
- Swine Production

The required outcomes for each specialization are structured as three nonsequential courses for a total of 16 credits. The first course in each specialization is offered for 6 credits and the other two courses are offered for 5 credits each.

For each specialization, local, seasonal and other factors will determine the order of delivering the three courses.

PROGRAM DELIVERY

Each course in each specialization of the Green Certificate Program is designed to be delivered off campus. Green Certificate courses must, therefore, be delivered in accordance with the Off-Campus Education policy, which requires that each potential workplace be inspected and approved annually by a person designated by the school authority.

In addition, a certificated teacher must be assigned the responsibility for ensuring that:

- the selected work placement provides a safe and caring learning environment
- effective learning is taking place
- the curriculum is being followed and that appropriate opportunities exist for the student to develop the competencies specified by the general and specific outcomes
- student progress is monitored and supervised
- student performance is appropriately assessed, in partnership with the employer and local AAFRD representative
- the student is enrolled in the corequisite course, CTR1210: Personal Safety (Management), prior to or concurrent with enrollment in the first Green Certificate course.

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C. STUDENT SELECTION, PLACEMENT AND ASSESSMENT

STUDENT SELECTION

In deciding to enroll in the Green Certificate Program, students should be able to indicate their understanding of what it means to enroll in an agricultural apprenticeship program.

Most students choosing to enroll in the Green Certificate Program self-select. That is, they request permission of their school to enroll in a specialization, having been encouraged to do so by a parent, relative or other party knowledgeable about the program.

Students who are interested in exploring career options in agriculture but who are not ready to commit to enrolling in the Green Certificate Program should be encouraged to consider enrolling in one or a combination of the following courses:

- Career Internship 10
- Work Experience 15, 25 or 35
- courses selected from the Agriculture strand of the Career and Technology Studies program.

In approving a student's request to enroll in Green Certificate courses, the teacher should consider the student's:

- current and planned school programs
- interests, career goals, maturity
- previous knowledge and experience in the agriculture industry
- understanding of the commitment required to ensure successful completion of the program.

STUDENT PLACEMENT

Students self-selecting to enroll in the Green Certificate Program have usually selected a specialization and identified a placement.

In situations where students have not identified an employer willing to accept them in a Green Certificate program, the local AAFRD coordinator may be contacted to assist in securing an appropriate placement. In addition, an AAFRD coordinator will provide an in-school introduction for new students entering the program or for those interested in learning more about the program.

STUDENT ASSESSMENT

Assessment of student progress and performance in a Green Certificate course must be ongoing and be conducted through consultation among:

- the certificated teacher assigned by the school to supervise the student
- the student's workplace trainer
- assessors designated by AAFRD.

At the completion of each Green Certificate course, AAFRD assessors at a provincial assessment centre will formally evaluate the student's knowledge and skills to determine if the student has met the general and specific outcomes specified for the course.

Teachers are encouraged to participate in these end-of-course assessment processes.

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D. SCOPE AND SEQUENCE

The courses identified for each specialization are nonsequential. Local, seasonal and other factors will determine the order of course delivery in each specialization.

Corequisite Course

CTR1210: Personal Safety (Management), a 1-credit course from the Career Transitions strand of the Career and Technology Studies program, must be completed prior to or concurrent with the first Green Certificate course, in any specialization, in which a student enrolls.

Nonsequential Courses			Specialization
Bee Operation Preparation and Planning 33 (6 credits)	Bee Operation Production and Practices 33 (5 credits)	Bee Operation Support Systems 33 (5 credits)	Bee Keeper Production
Cattle Care and Production 33 (6 credits)	Calving and Herd Health 33 (5 credits)	Beef Support Systems 33 (5 credits)	Cow–Calf Beef Production
Animal Husbandry and Health 33 (6 credits)	Dairy Operations 33 (5 credits)	Dairy Equipment Operation and Service 33 (5 credits)	Dairy Production
Handling Feedlot Cattle 33 (6 credits)	Feedlot Cattle Care and Feeding 33 (5 credits)	Feedlot Support Systems 33 (5 credits)	Feedlot Beef Production
Field Crop Care 33 (6 credits)	Land Preparation and Planting 33* (5 credits)	Harvesting Operations 33** (5 credits)	Field Crop Production
Irrigation Processes and Practices 33 (6 credits)	Field and Crop Preparation 33* (5 credits)	Field Crop and Forage Harvesting 33** (5 credits)	Irrigated Field Crop Production
Sheep Production and Health 33 (6 credits)	Sheep Farm Operations and Equipment 33 (5 credits)	Sheep Handling and Facilities 33 (5 credits)	Sheep Production
Swine Behaviour and Production 33 (6 credits)	Swine Handling and Welfare 33 (5 credits)	Swine Health and Operations 33 (5 credits)	Swine Production

*** Students may earn credits in either Land Preparation and Planting 33 OR Field and Crop Preparation 33.**
**** Students may earn credits in either Harvesting Operations 33 OR Field Crop and Forage Harvesting 33.**

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E. COURSE DESCRIPTIONS BY SPECIALIZATION

Students completing all three courses in a specialization, to the standards specified, will earn the technician level Green Certificate for that specialization, which is issued by Alberta Agriculture, Food and Rural Development.

Note: To earn the technician level Green Certificate in Field Crop Production, students must complete the following courses to the standards specified: Field Crop Care 33, Land Preparation and Planting 33 **OR** Field and Crop Preparation 33, and Harvesting Operations 33 **OR** Field Crop and Forage Harvesting 33.

To earn the technician level Green Certificate in Irrigated Field Crop Production, students must complete the following courses to the standards specified: Irrigation Processes and Practices 33, Field and Crop Preparation 33 **OR** Land Preparation and Planting 33, and Field Crop and Forage Harvesting 33 **OR** Harvesting Operations 33.

Bee Keeper Production Technician	**Bee Operation Preparation and Planning 33** (6 credits) Students are introduced to the basic biology and behaviour of bees; study pollination requirements; receive and install package bees; maintain hive equipment, schedule production season activities and comply with government regulations; manage wildlife, vandals and minimize pesticide damage; safely operate and maintain farm trucks, trailers and accessories; demonstrate a positive attitude toward safety; and demonstrate effective and appropriate employability skills.	**Bee Operation Production and Practices 33** (5 credits) Students demonstrate their ability to perform routine field work with colonies, queens and cells; feed bees sugar and protein; control parasitic mites, prevent blood diseases and nosema disease; operate and maintain forklifts, boom trucks and power tail gates under specified conditions; and demonstrate effective and appropriate employability skills.	**Bee Operation Support Systems 33** (5 credits) Students demonstrate the ability to plan the winter and spring season; prepare for winter and complete related activities; use integrated pest management strategies; describe the functions and design of buildings; describe bee specialty enterprises; safely operate and maintain hand tools and power tools; and demonstrate effective and appropriate employability skills.
Cow–Calf Beef Production Technician	**Cattle Care and Production 33** (6 credits) Students are introduced to the anatomy and physiology of cattle; study animal behaviour; handle and move cattle; recognize and treat specified cattle diseases and disorders; safely operate and maintain farm vehicles in yards, on fields and on public roads; demonstrate a positive attitude toward safety; and demonstrate effective and appropriate employability skills.	**Calving and Herd Health 33** (5 credits) Students demonstrate their ability to maintain cattle health; operate a feeding program, including monitoring a feeding plan; operate trucks and tractors under specified conditions; and demonstrate effective and appropriate employability skills.	**Beef Support Systems 33** (5 credits) Students demonstrate the ability to ship, move and receive cattle; perform basic first aid on cattle; perform basic pest control operations; safely operate and maintain hand tools and power tools; perform basic services on trucks and tractors; and demonstrate effective and appropriate employability skills.

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Dairy Production Technician	**Animal Husbandry and Health 33** (6 credits) Students demonstrate the ability to handle cattle, perform castration by elastrator, maintain cattle health, water cattle, perform safety practices, and demonstrate effective and appropriate employability skills.	**Dairy Operations 33** (5 credits) Students demonstrate the ability to handle livestock of all ages, operate milk-handling equipment, milk cows, operate milk sampling and recording equipment, read and interpret milk quality reports, maintain sanitation, demonstrate safe work skills and a positive attitude toward safety, and demonstrate effective and appropriate employability skills in a variety of workplace situations.	**Dairy Equipment Operation and Service 33** (5 credits) Students operate manure spreaders; maintain cattle health and breeding; feed the dairy herd; operate farm equipment; maintain fences and corrals, using fence amending tools; select and use basic hand and shop tools correctly; and demonstrate effective and appropriate employability skills.
Feedlot Beef Production Technician	**Handling Feedlot Cattle 33** (6 credits) Students demonstrate the ability to process and handle cattle, including receiving cattle, implanting growth stimulants, applying ear tags, vaccinating cattle, branding cattle, shipping cattle, applying insecticides, dehorning cattle and performing castration; maintain facilities, using appropriate housekeeping procedures; and demonstrate effective and appropriate employability skills.	**Feedlot Cattle Care and Feeding 33** (5 credits) Students demonstrate the ability to process and handle cattle; treat cattle; perform pen-checking duties; handle and administer treatment drugs; identify and treat selected cattle diseases, disorders and parasites; pull cattle from pens; receive feedstuffs; prepare and maintain bedding; and demonstrate effective and appropriate employability skills.	**Feedlot Support Systems 33** (5 credits) Students demonstrate the ability to operate livestock handling equipment, including a cattle weigh scale; feed cattle; operate a feed truck, and service equipment; use operator manuals; demonstrate knowledge of road travel regulations; operate trucks and operate tractors with front-end loaders; perform routine truck servicing; use fire extinguishers and basic hand and power tools; repair fences and corrals; and demonstrate effective and appropriate employability skills.

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Field Crop Production Technician	**Field Crop Care 33** (6 credits) Students demonstrate planting abilities; use basic servicing equipment and tools; operate, service and maintain an auger; identify signs of weeds, pests, diseases and disorders in grain fields; operate crop sprayers; have a working knowledge of a farm's marketing program; demonstrate crop care, by operating a swather and determining moisture levels; demonstrate a positive attitude toward safety; and demonstrate effective and appropriate employability skills.	**Land Preparation and Planting 33** (5 credits) Students demonstrate the ability to perform planting activities, by understanding a farm's cropping program, following regulations and operating farm equipment, including cultivators, fertilizer applicators, trucks, tractors and towed implements; use basic servicing tools; demonstrate safety practices, including performing emergency first aid; and demonstrate effective and appropriate employability skills.	**Harvesting Operations 33** (5 credits) Students demonstrate the ability to harvest grain and forage crops, operate a combine, store a grain harvest, prepare crop storage facilities, and demonstrate effective and appropriate employability skills.
Irrigated Field Crop Production Technician	**Irrigation Processes and Practices 33** (6 credits) Students demonstrate the ability to handle, operate and maintain irrigation equipment according to a farm's protocol and following related legislation; prepare and secure piped systems for winter storage; care for crops by identifying signs of pests, disorders and diseases; demonstrate a working knowledge of a farm's marketing plan; demonstrate a positive attitude toward safety; and demonstrate effective and appropriate employability skills.	**Field and Crop Preparation 33** (5 credits) Students demonstrate the ability to perform planting activities, by understanding a farm's cropping program, following regulations and operating farm equipment, including cultivators, fertilizer applicators, trucks, tractors and towed implements; use basic servicing tools; demonstrate crop care, by identifying weed infestations and minimizing the introduction and spread of weeds; demonstrate farm safety, including emergency first aid and knowledge of components of fire; and demonstrate effective and appropriate employability skills.	**Field Crop and Forage Harvesting 33** (5 credits) Students demonstrate the ability to operate a grain auger, harvest grain and forage crops, operate a swather, operate a combine, store a grain harvest, prepare crop storage facilities, and demonstrate effective and appropriate employability skills.

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Sheep Production Technician	**Sheep Production and Health 33** (6 credits) Students demonstrate the ability to manage sheep grazing, maintain sheep health, demonstrate knowledge of basic sheep enterprises, distinguish among breeds of sheep, demonstrate knowledge of sheep nutrition and lamb management, assist with sheep reproduction, demonstrate knowledge of basic sheep marketing practices, identify and maintain farm records, and demonstrate effective and appropriate employability skills.	**Sheep Farm Operations and Equipment 33** (5 credits) Students demonstrate knowledge of how to dispose of dead sheep, feed sheep and manage waste, operate farm equipment, demonstrate a positive attitude toward safety and safe work skills, and demonstrate effective and appropriate employability skills.	**Sheep Handling and Facilities 33** (5 credits) Students demonstrate the ability to handle sheep, including tipping a sheep, crutching a sheep, applying tags and other identifiers, and shearing a sheep; demonstrate knowledge and apply the principles and practices of the Recommended Code of Practice for the Care and Handling of Sheep; and demonstrate effective and appropriate employability skills.
Swine Production Technician	**Swine Behaviour and Production 33** (6 credits) Students study swine behaviour, demonstrate the knowledge and ability to handle breeding stock, feed swine, recognize specified swine disorders and diseases, maintain facilities, safely operate and maintain farm equipment, perform basic record keeping, and demonstrate effective and appropriate employability skills.	**Swine Handling and Welfare 33** (5 credits) Students demonstrate their ability to wean pigs, operate feed handling equipment, castrate baby pigs, operate a manure handling system, monitor and maintain facility environmental controls, and demonstrate effective and appropriate employability skills.	**Swine Health and Operations 33** (5 credits) Students demonstrate a working knowledge of swine anatomy, basic disorders and diseases of swine, and the herd's health program; demonstrate the ability to handle and administer medications and vaccines; demonstrate knowledge of the farm's operating management systems, including indicators, goals and targets, Alberta hog marketing strategies, and quality assurance programs; and demonstrate effective and appropriate employability skills.

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BEE KEEPER PRODUCTION TECHNICIAN

COURSE: **BEE OPERATION PREPARATION AND PLANNING 33**

Corequisite: CTR1210: Personal Safety Management

Note: Students are required to complete the corequisite course prior to or concurrent with their enrollment in the first course of the Bee Keeper Production Technician specialization.

Description: Students are introduced to the basic biology and behaviour of bees; study pollination requirements; receive and install package bees; maintain hive equipment, schedule production season activities and comply with government regulations; manage wildlife, vandals and minimize pesticide damage; safely operate and maintain farm trucks, trailers and accessories; demonstrate a positive attitude toward safety; and demonstrate effective and appropriate employability skills.

Parameters: Each of the three courses that constitute the Bee Keeper Production Technician specialization is designed to be delivered off campus. The annual inspection and approval of the work station, and the monitoring, supervision and assessment of each student's progress and performance must be done in accordance with the procedures specified in the Off-Campus Education policy.

Prescribed General Outcomes: *The student will:*

- demonstrate the ability to handle bees, by:
  - identifying and interpreting bee behaviour
  - receiving and installing bees
- demonstrate the ability to:
  - maintain hive equipment
  - schedule production season activities
  - describe the basic biology of bees
  - explain pollination requirements
  - describe government regulations
  - manage wildlife and vandals
  - minimize pesticide damage
- service, safely and appropriately, general farm equipment, including:
  - trucks and tractors
  - trailers and towing equipment

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- operate trucks and tractors under specified conditions:
  - in yards
  - on fields
  - on farm and public roads
- demonstrate a positive attitude toward safety and safe work skills and habits, including:
  - hazard identification and safety incident prevention
  - fire safety
  - farm first aid
- demonstrate effective and appropriate employability skills.

COURSE: **BEE OPERATION PRODUCTION AND PRACTICES 33**

Corequisite: CTR1210: Personal Safety Management

Note: Students are required to complete the corequisite course prior to or concurrent with their enrollment in the first course of the Bee Keeper Production Technician specialization.

Description: Students demonstrate their ability to perform routine field work with colonies, queens and cells; feed bees sugar and protein; control parasitic mites, prevent blood diseases and nosema disease; operate and maintain forklifts, boom trucks and power tail gates under specified conditions; and demonstrate effective and appropriate employability skills.

Parameters: Each of the three courses that constitute the Bee Keeper Production Technician specialization is designed to be delivered off campus. The annual inspection and approval of the work station, and the monitoring, supervision and assessment of each student's progress and performance must be done in accordance with the procedures specified in the Off-Campus Education policy.

Prescribed General Outcomes: *The student will:*

- demonstrate the ability to perform routine field work, by:
  - working with bee colonies
  - working with queens and cells
  - feeding bees sugar and protein
- demonstrate the ability to maintain bee health, by:
  - preventing blood diseases
  - preventing nosema disease
  - controlling parasitic mites
- operate trucks and tractors under specified conditions, by:
  - operating and maintaining forklifts
  - operating and maintaining boom trucks
  - operating and maintaining power tail gates
  - understanding farm truck travel regulations
- demonstrate a positive attitude toward safety and safe work skills and habits, including:
  - hazard identification and safety incident prevention

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  - fire safety
  - farm first aid
- demonstrate effective and appropriate employability skills.

COURSE: **BEE OPERATION SUPPORT SYSTEMS 33**

Corequisite: CTR1210: Personal Safety Management
Note: Students are required to complete the corequisite course prior to or concurrent with their enrollment in the first course of the Bee Keeper Production Technician specialization.

Description: Students demonstrate the ability to plan the winter and spring season; prepare for winter and complete related activities; use integrated pest management strategies; describe the functions and design of buildings; describe bee specialty enterprises; safely operate and maintain hand tools and power tools; and demonstrate effective and appropriate employability skills.

Parameters: Each of the three courses that constitute the Bee Keeper Production Technician specialization is designed to be delivered off campus. The annual inspection and approval of the work station, and the monitoring, supervision and assessment of each student's progress and performance must be done in accordance with the procedures specified in the Off-Campus Education policy.

Prescribed General Outcomes: *The student will:*

- demonstrate the ability to maintain beekeeping operations, by:
  - preparing for winter and completing related activities
  - planning the winter and spring season operations
  - using integrated pest management strategies
  - extracting honey and handling wax
  - describing bee specialty enterprises
  - describing functions and design of buildings
- operate, safely, care for and maintain small tools and accessories, including:
  - hand and power tools
  - bench and portable grinders
  - tanks, pumps, taps and fillers
  - scales, drum carts, hive tools, scratchers and embedders
  - smokers, blowers, fume boards, pressure washers, weed whackers, etc.
- operate trucks and tractors under specified conditions, and select and use battery and tire maintenance tools
- demonstrate a positive attitude toward safety and safe work skills and habits, including:
  - hazard identification and safety incident prevention
  - handle hazardous farm materials safely
  - fire safety
  - farm first aid
- demonstrate effective and appropriate employability skills.

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INTEGRATED OCCUPATIONAL PROGRAM

CONTENTS

Occupational Component 26–36❶

Social Studies 26❷

❶ IOP occupational courses at the 16 level have been withdrawn as of September 2006 and occupational courses at the 26 level have been withdrawn as of September 2007. Occupational courses at the 36 level will be withdrawn in September 2008.

Note: Fashion and Fabric Services will be withdrawn at the 26 level in September 2008 and at the 36 level in September 2009.

Agricultural Production and Natural Services will be withdrawn at the 26 level in September 2008 and at the 36 level in September 2009.

❷ Provincial implementation for Knowledge and Employability Social Studies 20-4 will be in 2008–2009.

Note: In cases where specific learner expectations repeat across levels, it is expected that teachers will help students increase in proficiency from level to level.

A primary goal of the Integrated Occupational Social Studies Program is responsible citizenship. Social studies learning is a developmental process during which knowledge, skills and related attitudes are refined and expanded over time, in various contexts.

Integration

In order to provide a clear statement of what students are expected to learn about each theme, the content has been organized into attitude, knowledge and skill objectives. Social studies skills and related knowledge and attitudes are interdependent; therefore, learner expectations are to be incorporated into an organizational model. Sample instructional activities are provided in the teacher resource manual. Flexibility in selecting and designing an instructional organization is intended to accommodate the needs of students, maximize the use of available resources and allow for coordination of instructional planning. Consequently, the knowledge, skill and attitude objectives should be integrated for instructional purposes, not taught in an isolated fashion.

Critical and creative thinking skills are integrated within the learner expectations to enhance student ability to process information, solve problems and make decisions.

Equal weighting should be given to knowledge and skill objectives. Attitude objectives should receive continuous and informal evaluation.

Sequence

Students differ in the ways and rates at which they acquire knowledge, skills and attitudes. Teachers are encouraged to sequence objectives and activities to maximize students' strengths and focus on needs. It is intended that skills and related knowledge and attitudes be applied to progressively difficult and/or age-appropriate situations as students advance through senior high school. Successful sequencing involves matching learning tasks in context with individual student's needs, interests, learning preferences and maturity level. The sequence should begin with the identification of the student's current performance and knowledge, lead to the diagnosis of problem areas and focus on promoting growth in social studies.

Additional information about integrating and sequencing is available in the program of studies/curriculum guide and corresponding teacher resource manual for each course.

Effective September 2007, IOP Social Studies 16, pages 12 to 18, have been **removed** and **replaced** with the **new provincially implemented** Knowledge and Employability Social Studies 10-4, pages 1 to 38 (2007).

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KNOWLEDGE AND EMPLOYABILITY

CONTENTS

Academic Courses

- English Language Arts 10-4, 20-4, 30-4
- Mathematics 10-4, 20-4
- Science 10-4, 20-4
- Social Studies 10-4, 20-4

Occupational Component Courses

- Occupational Courses 10-4, 20-4, 30-4
- Art/Design and Communication
- Auto Mechanics
- Business Services
- Construction
- Cosmetology
- Fabrics
- Foods
- Horticulture
- Human Care
- Natural Resources
- Workplace Readiness

Knowledge and Employability Social Studies	
School Year	**Provincial Implementation**
2007–2008	**Grade 10: 10-4**
2008–2009	Grade 11: 20-4

KNOWLEDGE AND EMPLOYABILITY SOCIAL STUDIES 10-4, 20-4

Policy: Knowledge and Employability courses provide students who meet the criteria with opportunities to experience success and become well prepared for employment, further studies, citizenship and lifelong learning (*Knowledge and Employability Courses Policy 1.4.2*).

VISION

Through Knowledge and Employability courses, students become active and responsible citizens, achieve their educational and career goals, improve quality of life for themselves and their families and positively impact their communities.

PHILOSOPHY AND RATIONALE

The development of the Knowledge and Employability courses was based on input received from consultations with education stakeholders throughout the province. The distinctive sequence of courses was designed to meet the educational needs of students who learn best:

- when focusing on the development and application of reading, writing and mathematical literacy,[1] and on essential employability skills
- through experiential learning activities
- when meaningful connections are made between schooling and personal experiences.

Knowledge and Employability courses assist students in:

- transitioning from school to the workplace and community
- preparing for responsible citizenship
- gaining recognition, respect and value from employers and further education providers.

Knowledge and Employability courses promote student skills, abilities and work ethics, including:

- academic and occupational skills of a standard determined by the workplace to be necessary for success
- practical applications through on- and off-campus experiences and/or community partnerships
- career development skills to explore careers, develop a career-focused portfolio and assess career skills
- interpersonal skills to ensure respect, support and cooperation with others.

1. Mathematical literacy: Selecting and applying appropriate mathematical operations, problem-solving strategies, tools and technology, and communicating using mathematical vocabulary in home, workplace and community experiences.

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Aboriginal Perspectives and Experiences
For historical, constitutional and social reasons, an understanding of First Nations, Métis and Inuit (FNMI) experiences and perspectives, and recognition that First Nations, Métis and Inuit students have particular needs and requirements, is necessary to enable all students to be respectful and responsible citizens.

Knowledge and Employability courses serve to facilitate positive experiences that will help Aboriginal students better see themselves in the curriculum and assist non-Aboriginal students to develop a better understanding of Alberta's First Nations, Métis and Inuit peoples.

GOALS OF KNOWLEDGE AND EMPLOYABILITY COURSES

Knowledge and Employability courses provide students with practical and applied opportunities to develop competencies necessary to meet or exceed the following goals. Knowledge and Employability courses prepare students to:

- earn a senior high school credential
- enter the workplace upon leaving school with employability and occupational skills that meet industry standards
- make successful transitions to other courses or to further education and training
- become responsible and contributing members of society.

CROSS-CURRICULAR, COMMUNITY AND WORKPLACE CONNECTIONS

Programs of study and resources for Knowledge and Employability courses are distinctive, in part, because they promote cross-curricular, community and workplace connections.

Cross-curricular Connections
Knowledge and Employability courses promote the integration of subjects to emphasize their interrelationships and connections to other school subjects. The philosophy of Knowledge and Employability courses is that students learn best when they can clearly recognize, in their course work, connections, applications and relevance to a variety of everyday experiences. Organizing for instruction may include thematic units, subject integration within units and/or projects in other subjects.

Community and Workplace Connections
Knowledge and Employability courses provide students with practical and applied opportunities to develop basic reading, writing and mathematical literacy. Community and workplace connections ensure learning within applied contexts, connecting the school with environments beyond school, and may include tours to local businesses and industries, mentorships, job shadowing and work experience.

Knowledge and Employability courses promote the development of career portfolios that help students connect their school experience to the world beyond school. Each portfolio will include exemplars of the student's on- and off-campus experiences and can be used when the student is seeking employment or further education/training opportunities. Items appropriate for inclusion in career portfolios include résumés, samples of written work, awards and/or their representations, teacher and self-evaluation checklists, workplace assessment tools and employer letters of recommendation.

SAFETY

Safety is emphasized and relevant information is incorporated throughout Knowledge and Employability courses, including basic safety rules and guidelines and information regarding the safe use of tools, equipment and materials in school, home, community and workplace settings.

TECHNOLOGY

Because technology is best learned within an applied context, Information and Communication Technology (ICT) outcomes, and the use of computers and other technologies, are included in Knowledge and Employability courses. This technology integration will help students make the transition to the world beyond school.

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ESSENTIAL UNIVERSAL SKILLS AND STRATEGIES

Knowledge and Employability courses emphasize the universal skills and strategies that are essential to all students, including the following:

- Interpersonal skills promote teamwork and respect for, support of and cooperation with others.
- Critical thinking promotes the analysis and appropriate applications of information.
- Creative thinking promotes the identification of unique connections among ideas and insightful approaches to questions and issues.
- Decision-making processes promote the making of timely and appropriate decisions.
- Problem-solving processes promote the ability to identify or pose problems and apply learning to consider the causes and dimensions of, and the solutions to, problems.
- Metacognition[2] enables students to become more aware of, and have greater control over, their own thinking and learning processes.

RELATIONSHIP TO OTHER COURSES

Each Knowledge and Employability course is consistent with the rationale, philosophy, program foundations and organization of other secondary courses. This consistency enables students, as appropriate, to progress through the Knowledge and Employability course sequence and/or to other secondary courses.

ENROLLMENT IN KNOWLEDGE AND EMPLOYABILITY COURSES

Students may take one or more courses in the sequence at any time during grades 8 through 12. Students may be enrolled in only Knowledge and Employability courses or in a combination of Knowledge and Employability and other secondary courses.

Information regarding the identification of students for enrollment in one or more courses can be accessed in the *Knowledge and Employability Courses Policy 1.4.2* and in the *Information Manual for Knowledge and Employability Courses, Grades 8–12.*

RATIONALE AND PHILOSOPHY OF KNOWLEDGE AND EMPLOYABILITY SOCIAL STUDIES

Social studies provides opportunities for students to develop the attitudes, skills and knowledge that will enable them to become engaged, active, informed and responsible citizens. Recognition and respect for individual and collective identity is essential in a pluralistic and democratic society. Social studies helps students develop their sense of self and community, encouraging them to affirm their place as citizens in an inclusive, democratic society.

Vision

The Alberta Knowledge and Employability social studies course sequence reflects the nature of 21st century learners. It has at its heart the concepts of citizenship and identity in the Canadian context. The courses reflect multiple perspectives, including Aboriginal and Francophone, that contribute to Canada's evolving realities. They foster the building of a society that is pluralistic, bilingual, multicultural, inclusive and democratic. The courses emphasize the importance of diversity and respect for differences as well as the need for social cohesion and the effective functioning of society. Social studies promotes a sense of belonging and acceptance in students as they engage in active and responsible citizenship at the local, community, provincial, national and global levels.

Central to the vision of the Alberta social studies program is the recognition of the diversity of experiences and perspectives and the pluralistic nature of Canadian society. Pluralism builds upon Canada's historical and constitutional foundations that reflect the country's Aboriginal heritage, bilingual nature and multicultural realities. A

2. Metacognition: Learning-to-learn strategies; awareness of processes and strategies one uses when learning.

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pluralistic view recognizes that citizenship and identity are shaped by multiple factors; e.g., culture, language, environment, gender, ideology, religion, spirituality and philosophy.

Definition of Social Studies

Social studies is the study of people in relation to each other and to their world. It is an issues-focused and inquiry-based interdisciplinary subject that draws upon history, geography, ecology, economics, law, philosophy, political science and other social science disciplines. Social studies fosters students' understanding of and involvement in practical and ethical issues that face their communities and humankind. Social studies is integral to the process of enabling students to develop an understanding of who they are, what they want to become and the society in which they want to live.

The Role of Social Studies

Social studies develops the key values, attitudes, knowledge, understandings, skills and processes necessary for students to become active and responsible citizens, engaged in the democratic process and aware of their capacity to effect change in their communities, society and world.

Values and Attitudes

Social studies provides learning opportunities for students to:

- value the diversity, respect the dignity and support the equality of all human beings
- demonstrate social compassion, fairness and justice
- appreciate and respect how multiple perspectives, including Aboriginal and Francophone, shape Canada's political, socio-economic, linguistic and cultural realities
- honour and value the traditions, concepts and symbols that are the expression of Canadian identity
- thrive in their evolving identity with a legitimate sense of belonging to their communities, Canada and the world
- demonstrate a global consciousness with respect to humanity and world issues
- demonstrate a consciousness for the limits of the natural environment, stewardship for the land and an understanding of the principles of sustainability
- value lifelong learning and opportunities for careers in the areas of social studies and the social sciences.

Knowledge and Understanding

Social studies provides learning opportunities for students to understand:

- their rights and responsibilities in order to make informed decisions and participate fully in society
- the unique nature of Canada and its land, history, complexities and current issues
- how knowledge of the history of Alberta, of Canada and of the world contributes to a better comprehension of contemporary realities
- historic and contemporary issues, including controversial issues, from multiple perspectives
- the diversity of Aboriginal traditions, values and attitudes
- the contemporary challenges and contributions of Aboriginal peoples in urban, rural, cultural and linguistic settings
- the historical and contemporary realities of Francophones in Canada
- the multi-ethnic and intercultural makeup of Francophones in Canada
- the challenges and opportunities that immigration presents to newcomers and to Canada
- how social cohesion can be achieved in a pluralistic society
- how political and economic distribution of power affects individuals, communities and nations
- the role of social, political, economic and legal institutions as they relate to individual and collective well-being and a sustainable society
- how opportunities and responsibilities change in an increasingly interdependent world
- that humans exist in a dynamic relationship with the natural environment.

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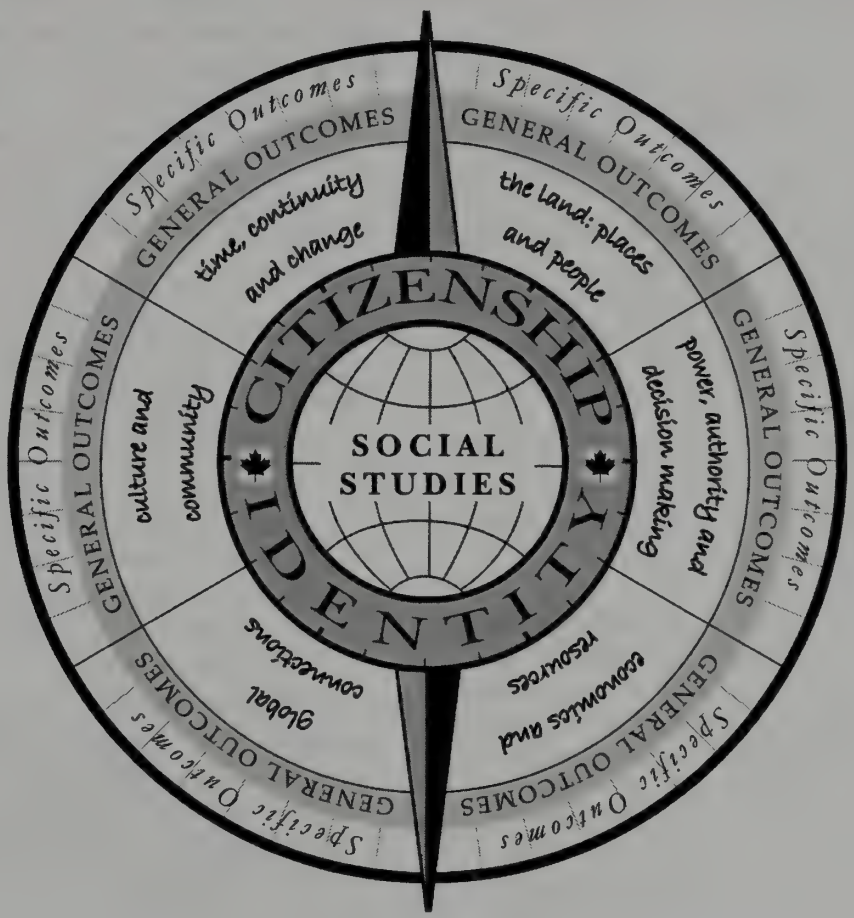
Skills and Processes
Social studies provides learning opportunities for students to:

- engage in active inquiry and critical and creative thinking
- engage in problem solving and conflict resolution with an awareness of the ethical consequences of decision making
- apply historical and geographic skills to bring meaning to issues and events
- use and manage information and communication technologies critically
- conduct research ethically using varied methods and sources; organize, interpret and present their findings and defend their opinions
- apply metacognition skills, reflecting upon what they have learned and what they need to learn
- recognize and responsibly address injustices as they occur in their schools, communities, Canada and the world
- communicate ideas and information in an informed, organized and persuasive manner.



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PROGRAM FOUNDATION

The program of studies provides a foundation of learning experiences that addresses critical aspects of social studies and its application. These critical areas provide general direction for the program of studies and identify the major components of its structure.

CORE CONCEPTS OF CITIZENSHIP AND IDENTITY

The dynamic relationship between citizenship and identity forms the basis for skills and learning outcomes in the program of studies.

The goal of social studies is to provide learning opportunities for students to:

- understand the principles underlying a democratic society
- demonstrate a critical understanding of individual and collective rights
- understand the commitment required to ensure the vitality and sustainability of their changing communities at the local, provincial, national and global levels
- validate and accept differences that contribute to the pluralistic nature of Canada
- respect the dignity and support the equality of all human beings.

The sense of being a citizen, enjoying individual and collective rights and equitable status in contemporary society, impacts an individual's sense of identity. Individuals need to feel that their identities are viewed as legitimate before they can contribute to the public good and feel a sense of belonging and empowerment as citizens.

Social studies provides learning opportunities for students to:

- understand the complexity of identity formation in the Canadian context
- understand how identity and self-esteem are shaped by multiple personal, social, linguistic and cultural factors
- demonstrate sensitivity to the personal and emotional aspects of identity
- demonstrate the skills required to maintain individuality within a group
- understand that with empowerment comes personal and collective responsibility for the public good.

SOCIAL STUDIES AND ABORIGINAL PERSPECTIVES AND EXPERIENCES

For historical and constitutional reasons, an understanding of Canada requires an understanding:

- of Aboriginal perspectives
- of Aboriginal experiences
- that Aboriginal students have particular needs and requirements.

Central to Aboriginal identity are languages and cultures that link each group with its physical world, worldviews and traditions. The role of Elders and community leaders is essential in this linkage.

The social studies program of studies provides learning opportunities that contribute to the development of self-esteem and identity in Aboriginal students by:

- promoting and encouraging balanced and holistic individuality and strengthening individual capacity
- honouring and valuing the traditions, concepts and symbols that are the expression of their individual identities
- providing opportunities for students to express who they are with confidence as they interact and engage with others
- contributing to the development of active and responsible members of groups and communities.

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SOCIAL STUDIES AND FRANCOPHONE PERSPECTIVES AND EXPERIENCES

For historical and constitutional reasons, an understanding of Canada requires an understanding:

- of Francophone perspectives
- of Francophone experiences
- that Francophone students have particular needs and requirements.

Social studies occupies a central position in successful Francophone education in Alberta. Francophone schools are a focal point of the Francophone community. They meet the needs and aspirations of parents by ensuring the vitality of the community. For students enrolled in Francophone schools, the social studies program will:

- strengthen Francophone self-esteem and identity
- encourage students to contribute, actively, to the flourishing of Francophone culture, families and communities
- promote partnerships among the home, community and business world
- engage students in participating in the bilingual and multicultural nature of Canada.

PLURALISM: DIVERSITY AND COHESION

One of the goals of the social studies program is to foster understanding of the roles and contributions of linguistic, cultural and ethnic groups in Canada. Students will learn about themselves in relation to others. Social studies helps students to function as citizens in a society that values diversity and cohesion.

A key component of effective social organizations, communities and institutions is recognition of diversity of experiences and perspectives. The program of studies emphasizes how diversity and differences are assets that enrich our lives. Students will have opportunities to value diversity, to recognize differences as positive attributes and to recognize the evolving nature of individual identities. Race, socio-economic conditions and gender are among various forms of identification that people live with and experience in a variety of ways.

Social studies addresses diversity and social cohesion and provides processes that students can use to work out differences, drawing on the strengths of diversity. These processes include:

- a commitment to respecting differences and fostering inclusiveness
- an understanding and appreciation for shared values
- a respect for democratic principles and decision-making processes; e.g., dialogue and deliberation.

Diversity contributes to the development of a vibrant democratic society. Through the interactions of place and historical processes of change, diversity has been an important asset in the evolution of Canadian society. Some key manifestations of this diversity include:

- First Nations, Inuit and Métis cultures
- official bilingualism
- immigration
- multiculturalism.

Accommodation of diversity is essential for fostering social cohesion in a pluralistic society. Social cohesion is a process that requires development of the relationships within and among communities. Social cohesion is manifested by respect for:

- individual and collective rights
- civic responsibilities
- shared values
- democracy
- rule of law
- diversity.

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SOCIAL STUDIES: LEARNERS AND LEARNING

Students bring their own perspectives, cultures and experiences to the social studies classroom. They construct meaning in the context of their lived experience through active inquiry and engagement with their school and community. In this respect, the infusion of current events, issues and concerns is an essential component of social studies.

Social studies recognizes the interconnections and interactions among school, community, provincial, national and global institutions.

The Knowledge and Employability program of studies for social studies provides learning opportunities for students to develop active and responsible citizenship skills and the capacity to inquire, make reasoned and informed judgements and arrive at decisions for the public good.

Students become engaged and involved in their communities by:

- asking questions
- making connections with their local community
- writing letters and articles
- sharing ideas and understandings
- listening to and collaborating and working with others to design the future
- empathizing with the viewpoints and positions of others
- creating new ways to solve problems.

ISSUES-FOCUSED APPROACH TO TEACHING SOCIAL STUDIES

A focus on issues through deliberation is intrinsic to the multidisciplinary nature of social studies and to democratic life in a pluralistic society. An issues-focused approach presents opportunities to address learning outcomes by engaging students in active inquiry and application of knowledge and critical thinking skills. These skills help students to identify the relevance of an issue by guiding them to develop informed positions and respect for the positions of others. This process enables students to question, validate, expand and express their understanding; to challenge their presuppositions and to construct their own points of view.

The program of studies is designed to promote metacognition through critical reflection, questioning, decision making and consideration of multiple perspectives on issues. Through this process, students will strive to understand and explain the world in the present and to determine what kind of world they want in the future.

Current Affairs

Social studies fosters the development of citizens who are informed and engaged in current affairs. Accordingly, current affairs play a central role in learning and are integrated throughout the program. Ongoing reference to current affairs adds relevance, interest and immediacy to social studies issues. Investigating current affairs from multiple perspectives motivates students to engage in meaningful dialogue on relevant historical and contemporary issues, helping them to make informed and reasoned decisions on local, provincial, national and global issues.

An issues-focused approach that incorporates multiple perspectives and current affairs helps students apply problem-solving and decision-making skills to real-life and controversial issues.

In order to allow opportunities for students to engage in current affairs, issues and concerns of a local nature, the program of studies provides the flexibility to include these topics within the time allotted for social studies.

Opportunities may include:

- current events in local communities
- issues with local, provincial, national and/or global relevance
- cultural celebrations
- visits from dignitaries
- special events.

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Controversial Issues
Controversial issues are those topics that are publicly sensitive and upon which there is no consensus of values or beliefs. They include topics on which reasonable people may sincerely disagree. Opportunities to deal with these issues are an integral part of social studies education in Alberta.

Studying controversial issues is important in preparing students to participate responsibly in a democratic and pluralistic society. Such study provides opportunities to develop the ability to think clearly, to reason logically, to open-mindedly and respectfully examine different points of view and to make sound judgements.

Controversial issues that have been anticipated by the teacher, and those that may arise incidentally during instruction, should be used by the teacher to promote critical inquiry and teach thinking skills.

STRANDS OF SOCIAL STUDIES

Learning related to the core concepts of citizenship and identity is achieved through focused content at each grade level. The six strands of social studies reflect the interdisciplinary nature of social studies. The strands are interrelated and constitute the basis for the learning outcomes in the program of studies.

Time, Continuity and Change
Understanding the dynamic relationships among time, continuity and change is a cornerstone of citizenship and identity. Considering multiple perspectives on history, and contemporary issues within their historical context, enables students to understand and appreciate the social, cultural and political dimensions of the past, make meaning of the present and make decisions for the future.

The Land: Places and People
Exploring the unique and dynamic relationship that humans have with the land, places and environments affects decisions that students make and their understanding of perspectives, issues, citizenship and identity. Students will examine the impact of physical geography on the social, political, environmental and economic organization of societies. This examination also affects students' understanding of perspectives and issues as they consider how connections to the land influence their sense of place.

Power, Authority and Decision Making
Examining the concepts of power, authority and decision making from multiple perspectives helps students consider how these concepts impact individuals, relationships, communities and nations. It also broadens students' understanding of related issues and perspectives and their effect on citizenship and identity. A critical examination of the distribution, exercise and implications of power and authority is the focus of this strand. Students will examine governmental and political structures, justice and laws, fairness and equity, conflict and cooperation, decision-making processes, leadership and governance. This examination develops a student's understanding of the individual's capacity in decision-making processes and promotes active and responsible citizenship.

Economics and Resources
Exploring multiple perspectives on the use, distribution and management of resources and wealth contributes to students' understanding of the effects that economics and resources have on quality of life around the world. Students will explore basic economic systems, trade and the effects of economic interdependence on individuals, communities, nations and the natural environment. Students will also critically consider the social and environmental implications of resource use and technological change.

Global Connections
Critically examining multiple perspectives and connections among local, national and global issues develops students' understanding of citizenship and identity and the interdependent or conflicting nature of individuals, communities, societies and nations. Exploring this interdependence broadens students' global consciousness and empathy with world conditions. Students will also acquire a better comprehension of tensions pertaining to economic relationships, sustainability and universal human rights.

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Culture and Community

Exploring culture and community allows students to examine shared values and their own sense of belonging, beliefs, traditions and languages. This promotes students' development of citizenship and identity and understanding of multiple perspectives, issues and change. Students will examine the various expressions of their own and others' cultural, linguistic and social communities.

GENERAL AND SPECIFIC OUTCOMES

The general and specific outcomes provide an organizational structure for development and assessment of student progress in the social studies program. Outcomes follow the progression of learning that occurs at each grade level. Key questions guide the development of outcomes.

General Outcomes

General outcomes identify what students are expected to know and be able to do upon completion of a grade.

Specific Outcomes

Specific outcomes identify explicit components of values and attitudes, knowledge and understanding and skills and processes that are included within each general outcome within each grade. Specific outcomes are building blocks that enable students to achieve general outcomes for each grade.

OUTCOMES RELATED TO VALUES AND ATTITUDES

Social studies provides an environment for the development of values and attitudes that enable students to participate actively and responsibly as citizens in a changing and pluralistic society. Attitudes are an expression of values and beliefs about an issue or topic. Respect, a sense of personal and collective responsibility and an appreciation of human interdependence are fundamental to citizenship and identity within local, national and global communities. Developing an ethic of care toward self, others and the natural world is central to these commitments.

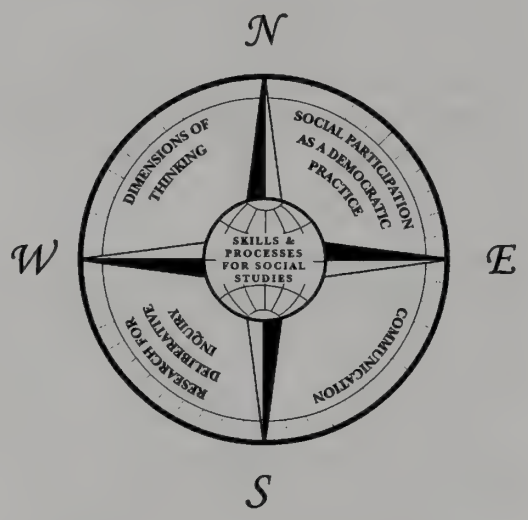
OUTCOMES RELATED TO KNOWLEDGE AND UNDERSTANDING

Outcomes related to knowledge and understanding are fundamental to informed decision making. Knowledge and understanding involve the breadth and depth of information, concepts, evidence, ideas and opinions.

OUTCOMES RELATED TO SKILLS AND PROCESSES

Outcomes for skills and processes provide opportunities for students to apply their learning to relevant situations and develop, practise and maintain essential skills as their learning evolves within a grade and from grade to grade. The skill outcomes are organized into the following categories.

- Dimensions of Thinking
- Social Participation as a Democratic Practice
- Research for Deliberative Inquiry
- Communication



Dimensions of Thinking

In social studies, students acquire and develop thinking strategies that assist them in making connections to prior knowledge, assimilating new information and applying learning to new contexts. The following dimensions of thinking have been identified as key components in social studies learning.

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Critical Thinking
Critical thinking is a process of inquiry, analysis and evaluation resulting in a reasoned judgement. Critical thinking promotes the development of democratic citizenship. Students will develop critical thinking skills that include distinguishing fact from opinion; considering the reliability and accuracy of information; determining diverse points of view, perspective and bias and considering the ethics of decisions and actions.

Creative Thinking
Creative thinking occurs when students identify unique connections among ideas and suggest insightful approaches to social studies questions and issues. Through creative thinking, students generate an inventory of possibilities, anticipate outcomes and combine logical, intuitive and divergent thought.

Historical Thinking
Historical thinking is a process whereby students are challenged to rethink assumptions about the past and to re-imagine both the present and the future. It helps students become well-informed citizens who approach issues with an inquiring mind and exercise sound judgement when presented with new information or a perspective different from their own. Historical thinking skills involve the sequencing of events, the analysis of patterns and the placement of events in context to assist in the construction of meaning and understanding. These skills can be applied to a variety of media; e.g., oral traditions, print, electronic text, art and music.

Historical thinking allows students to develop a sense of time and place to help define their identities. Exploring the roots of the present ensures the transmission and sharing of values and helps individuals to realize that they belong to a civil society. Historical thinking develops citizens willing to engage in a pluralistic democracy and promote and support democratic institutions.

Geographic Thinking
Possessing geographic thinking skills provides students with the tools to address social studies issues from a geographic perspective. Geographic thinking skills involve the exploration of spatial orders, patterns and associations. They enable students to investigate environmental and societal issues using a range of geographic information. Developing these spatial skills helps students understand the relationships among people, events and the context of their physical environment. This understanding will assist them to make choices and act wisely when confronted with questions affecting the land, water and connected resources.

Decision Making and Problem Solving
Students develop the ability to make timely and appropriate decisions by identifying the need for a decision and then weighing the advantages, disadvantages and consequences of various alternatives. Decision making involves reserving judgements until all the options and perspectives have been explored, seeking clarity for a variety of choices and perspectives, examining the cause-and-effect relationship between choices and basing decisions on knowledge, understandings, values and beliefs.

Problem-solving processes in social studies help students develop the ability to identify or pose problems and apply learning to consider the causes and dimensions of problems. These skills help develop thinking strategies, allowing students to determine possible courses of action and the consequences of potential solutions for a problem that may have multiple or complex causes and that may not have a clear solution. Activities such as simulations, debates, public presentations and editorial writing foster the development of these skills.

Metacognition
Metacognition is "thinking about thinking." It involves critical self-awareness, conscious reflection, analysis, synthesis, monitoring and reinvention. Students assess the value of the learning strategies they have used, modify them or select new strategies and monitor the use of re-invented or new strategies in future learning situations. In this respect, students become knowledge creators and contribute to a shared understanding of the world we live in—a key feature of democratic life and commitment to pluralism.

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Social Participation as a Democratic Practice
Social participation skills enable students to develop effective relationships with others, to work in cooperative ways toward common goals and to collaborate with others for the well-being of their communities. Students will develop interpersonal skills that focus on cooperation, conflict resolution, consensus building, collaborative decision making, the importance of responsibility and the acceptance of differences. Development of these skills will enhance active participation in their communities. Activities in this regard could include social action, community projects, school/community partnerships, e.g., church groups, Red Cross, Amnesty International, Médecins Sans Frontières (Doctors without Borders) and world agencies that assist children/families facing natural or political challenges.

Research for Deliberative Inquiry
Purposeful deliberation and critical reflection are essential skills and processes for democratic citizenship and problem solving. In social studies, the research process develops students who are independent, self-motivated problem solvers and cocreators of knowledge. Developing research skills prepares students for the world of work, post-secondary opportunities, lifelong learning and citizenship in a complex world. These skills also enhance and enrich the process of identity formation as students critically reflect on their sense of self and their relationship to others. The foundations of the research process are the application of acquired skills, the selection of appropriate resources and the use of suitable technology.

The Infusion of Technology
Technology encompasses the processes, tools and techniques that alter human activity. Information and communication technology provides a vehicle for communicating, representing, inquiring, making decisions and solving problems. It involves the processes, tools and techniques for:

- gathering and identifying information
- re-representations of dominant texts
- expressing and creating
- classifying and organizing
- analyzing and evaluating
- speculating and predicting.

Selected curriculum outcomes from Alberta Education's Information and Communication Technology (ICT) program of studies are infused throughout the Knowledge and Employability social studies program of studies and are indicated by this symbol ➢. Further information regarding the Information and Communication Technology program of studies is included within that program of studies.

Communication
Communication skills enable students to comprehend, interpret and express information and ideas clearly and purposefully. These skills include the language arts of listening, speaking, reading, writing, viewing and representing, as well as the use of communication technologies for acquiring and exchanging information and ideas.

Oral, Written and Visual Literacy Skills
Through the language arts, individuals communicate thoughts, feelings, experiences, information and opinions and learn to understand themselves and others. Speaking, writing and representing are used in the social studies program to relate a community's stories and to convey knowledge, beliefs, values and traditions through narrative history, music, art and literature.

Reading, listening and viewing in social studies enables students to extend their thinking and knowledge and increase their understanding of themselves and others. These skills provide students with a means of accessing the ideas, perspectives and experiences of others.

The language arts enable students to explore, organize and clarify thoughts and to communicate these thoughts to others.

Media Literacy Skills
Contemporary texts often involve more than one medium to communicate messages, have multilayered meanings and are often complex. Information texts include visual elements such as charts, graphs, diagrams, photographs, tables, pictures, collages and timelines. Media literacy skills involve accessing, interpreting and evaluating mass media texts; e.g., newspapers, television, the Internet and advertising. Media literacy in social studies explores concepts in mass

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media texts; e.g., identifying the key messages and multiple points of view that are being communicated, detecting bias and examining the responsibility of citizens to respond to media texts.

SCOPE AND SEQUENCE

Within the Knowledge and Employability social studies program of studies, the analysis of key issues at each grade level leads to an understanding of concepts, values and attitudes and the skills and processes necessary to explore solutions and make decisions. The structure provides continuity and linkages from grade to grade. In addition, key questions provide focus for the development of the general outcomes within each grade level.

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Level	Title and Topics	Linkages and Sequencing
10-4	**Living in a Globalizing World** *Should we embrace globalization?*	Students will examine globalization, the process by which the world is becoming increasingly connected and interdependent. They will explore historical aspects of globalization, as well as the effects of globalization on lands, cultures, human rights and quality of life. The infusion of multiple perspectives will allow students to examine the effects of globalization on peoples in Canada and other locations, including the impact on Aboriginal and Francophone communities. Students will develop skills to respond to issues emerging in a globalizing world, with particular emphasis on local environments and situations.
20-4	**Nationalism in Canada and the World** *Should we embrace nationalism?*	Students will examine various forms of nationalism and apply their perceptions to their own identity and sense of citizenship. They will investigate the influence of nationalism on historical and contemporary events. Students will explore the impacts of nationalism and efforts to promote internationalism. Examples will be drawn from the study of Aboriginal experiences, Québécois nationalism, Canadian nationalism, international institutions and current events.

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10-4: Living in a Globalizing World

Overview

Students will examine globalization, the process by which the world is becoming increasingly connected and interdependent. They will explore historical aspects of globalization, as well as the effects of globalization on lands, cultures, human rights and quality of life. The infusion of multiple perspectives will allow students to examine the effects of globalization on peoples in Canada and other locations, including the impact on Aboriginal and Francophone communities. Students will develop skills to respond to issues emerging in a globalizing world, with particular emphasis on local environments and situations.

Community partnerships and the study of local and current events provide additional opportunities to enhance citizenship by connecting in-school learning experiences to everyday living experiences outside of school. Community partnerships may include inviting guest speakers into the classroom, hosting cultural awareness activities, visiting community agencies/businesses and taking part in community events/activities.

Rationale

Globalization is a dynamic process. Students will develop an awareness of the impacts of globalization by examining associated opportunities and challenges. Students will explore the relationships among globalization, citizenship and identity. Recognizing and appreciating the influence of globalization will lead students to examine their roles as responsible and active citizens in a globalizing world and within their communities.

Key Issue	**Key Outcome**
Should we embrace globalization?	**Students will examine globalization with emphasis on the influence of globalization on local communities.**
Related Issues	**General Outcomes**
10-4.1 *Should globalization shape identity?*	Students will explore the impacts of globalization on their everyday lives.
10-4.2 *Should people in Canada respond to the consequences of historical globalization?*	Students will explore the effects of historical globalization on indigenous and nonindigenous peoples.
10-4.3 *Does globalization contribute to sustainable prosperity for all people?*	Students will explore economic, environmental and other impacts of globalization.
10-4.4 *How should I, as a citizen, respond to globalization?*	Students will examine their roles and responsibilities as citizens in a globalizing world.

Local and Global Current Affairs

In order to provide opportunities for students to connect their environments to the world beyond, the program of studies provides the flexibility to examine local current issues and concerns within the time allotted for social studies.

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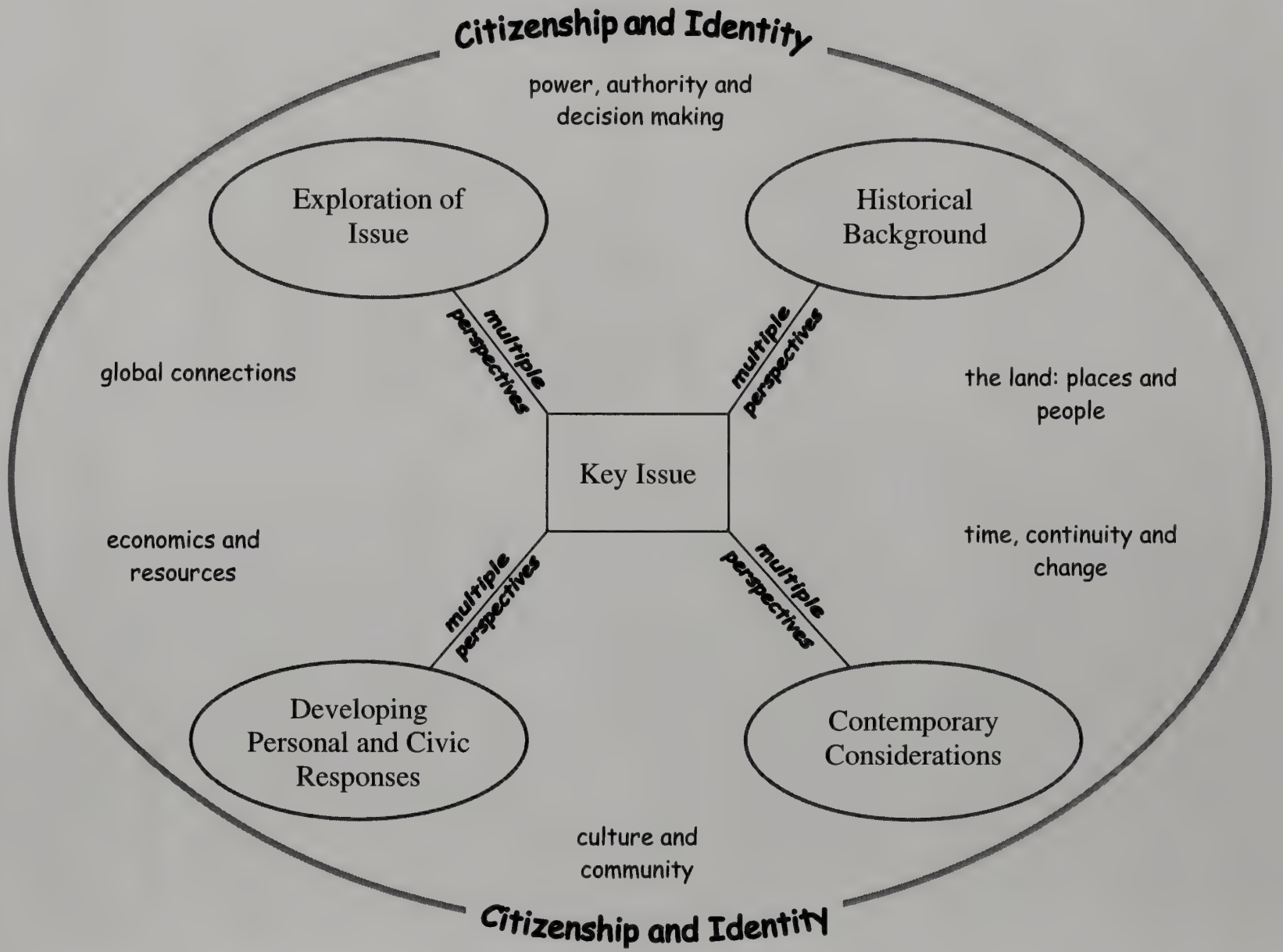

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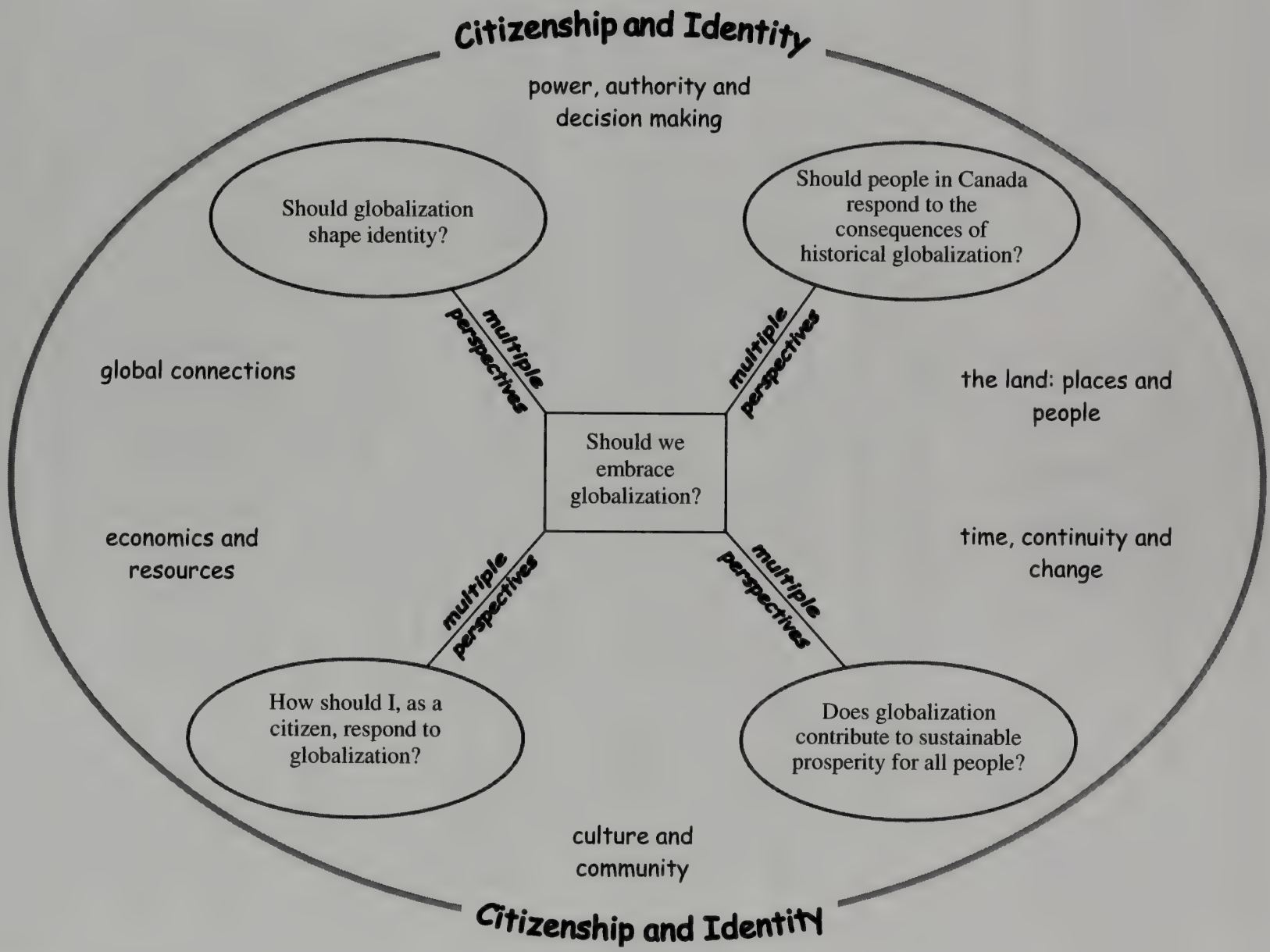
Citizenship and Identity
power, authority and decision making
Should globalization shape identity?
Should people in Canada respond to the consequences of historical globalization?
multiple perspectives
multiple perspectives
global connections
the land: places and people
Should we embrace globalization?
economics and resources
time, continuity and change
multiple perspectives
multiple perspectives
How should I, as a citizen, respond to globalization?
Does globalization contribute to sustainable prosperity for all people?
culture and community
Citizenship and Identity

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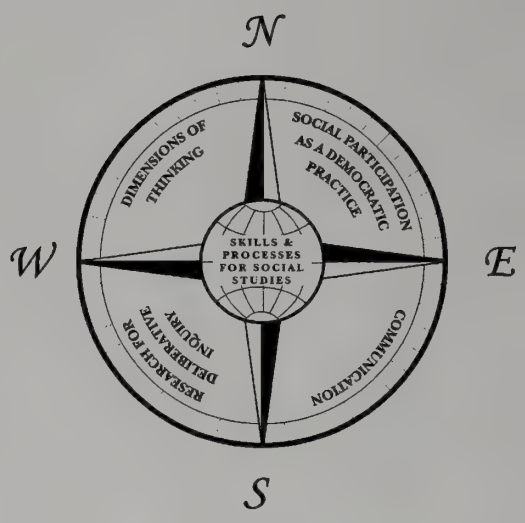

Benchmark Skills and Processes

The following benchmark skills and processes are outcomes to be achieved by the end of Knowledge and Employability Social Studies 20-4.

Dimensions of Thinking	
critical and creative thinking	Use an issue-analysis model to identify and define an issue or question, examine and evaluate several positions and formulate and defend a personal position.
historical thinking	Examine historical events/issues and their relationship to the present.
geographic thinking	Examine the impact of physical and human geography on history.
decision making and problem solving	Use a problem-solving model to identify the problem/issue, identify alternative solutions, consider the consequences of acting on each and choose, plan and defend a course of action and/or a decision.
Social Participation as a Democratic Practice	
cooperation, conflict resolution and consensus building	Work positively and collaboratively with others by considering their needs and perspectives and by using appropriate strategies to solve conflicts.
age-appropriate behaviour for social involvement	Engage in age-appropriate actions to enhance personal and community well-being.
Research for Deliberative Inquiry	
research and information	Apply a research process to access, select, organize, record, examine and interpret ideas and information.
Communication	
oral, visual and textual literacy	Communicate effectively, using appropriate print and nonprint text forms and technologies and considering audience and purpose.
media literacy	Demonstrate understanding of the nature of media and how media influences an audience.

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SKILLS AND PROCESSES

The following skills and processes are to be developed within the contexts of the general and specific outcomes included in 10-4.1, 10-4.2, 10-4.3 and 10-4.4.

Alberta Education's Information and Communication Technology (ICT) curriculum is infused throughout social studies. Selected ICT outcomes are indicated by this symbol ➢.

SPECIFIC OUTCOMES

Dimensions of Thinking

Students will:

develop skills of critical and creative thinking:

- use an issue-analysis model to identify and define an issue or question, examine and evaluate several positions and formulate and defend a personal position
- re-evaluate their personal assumptions and opinions to reflect a broadened understanding of a topic or issue
- identify the main ideas underlying a position or issue
- investigate local and global current events from a variety of perspectives and examine how these perspectives can shape understanding
- examine the validity of information, based on context, bias, sources, objectivity, evidence and reliability
- demonstrate informed and ethical decision-making skills
- examine ways in which a society's culture may be reflected in a variety of forms; e.g., artwork, oral stories and dance.

Students will:

develop skills of historical thinking:

- examine diverse historical and contemporary perspectives within and across cultures
- summarize the key events of a specific time period and place those events in historical contexts; e.g., timelines and charts
- examine historical events/events and their relationship to the present
- examine the difference between various historical facts and interpretations

➢ use current, reliable information sources from around the world.

Students will:

develop skills of geographic thinking:

- examine ways in which natural and man-made geographic features influence world events
- use, construct and interpret maps to broaden their understanding, using technology as appropriate
- draw conclusions from maps and other geographic sources
- examine the impact of human activities on the land and the environment

➢ access and operate multimedia applications and technologies from stand-alone and online sources

➢ use a variety of technologies to assist in the preparation of maps.

	C Citizenship		I Identity		
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
CC	Culture and Community	PADM	Power, Authority and Decision Making	TCC	Time, Continuity and Change

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Students will:

demonstrate skills of decision making and problem solving:

- use a problem-solving model to identify the problem/issue, identify alternative solutions, consider the consequences of acting on each and choose, plan and defend a course of action and/or a decision
- reflect on their own and others' past actions when determining future actions and choices
- recognize that some problems may not have apparent or visible solutions
- ➢ describe a plan of action that uses technology to solve a problem
- ➢ use the appropriate tools and materials required to accomplish a plan of action
- ➢ evaluate the appropriateness of the technology used to investigate or solve a problem.

Social Participation as a Democratic Practice

Students will:

demonstrate skills of cooperation, conflict resolution and consensus building:

- consider the needs and perspectives of others
- reflect on their own perspectives, based on new information from other perspectives
- work positively and collaboratively with others
- listen attentively to others
- demonstrate leadership by persuading, compromising and negotiating to resolve conflicts and differences to reach group consensus
- identify and use appropriate strategies to resolve conflicts peacefully and equitably
- use peer and self-evaluations to set attainable goals to improve learning.

Students will:

demonstrate age-appropriate behaviour for social involvement as respectful and responsible citizens contributing to the community:

- respond respectfully to the inherent meanings of artistic, musical, literary and other representations of culture and history
- participate in a community to protect and affirm their identities, as appropriate
- plan, evaluate and implement actions that support fairness, justice and equality
- support environmental stewardship; e.g., recycling, reducing consumption
- ➢ develop a plan of action to use technology to solve a problem.

Research for Deliberative Inquiry

Students will:

apply research processes:

- pose questions to direct inquiry and research processes and formulate new questions as research progresses
- access and select different points of view, using a variety of sources
- locate information by using the various parts of an information source; e.g., glossary, table of contents and index
- draw upon visual, literary, musical and auditory sources, e.g., Aboriginal experiences, when inquiring into questions and issues
- demonstrate responsible and ethical use of information and technology

	C Citizenship			I Identity	
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CC	Culture and Community	PADM	Power, Authority and Decision Making	TCC	Time, Continuity and Change

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- conduct a plan for an inquiry that includes time management
- ➢ plan and perform searches using more than one electronic source
- ➢ use calendars and time and/or project management software to assist in organizing the research process
- ➢ refine searches to limit sources to a manageable number
- ➢ select information from appropriate sources, including primary and secondary sources
- identify and record main ideas
- organize information using a variety of strategies and tools; e.g., graphs, charts, graphic organizers and technology as appropriate
- distinguish fact from opinion in a variety of information sources; e.g., media reports and accounts
- compare various interpretations, using a variety of evidence; e.g., photographs, artifacts, storytellers and interviews
- observe and interpret trends and relationships using tables and graphs
- interpret ideas and information to compare and contrast perspectives; e.g., bias, racism, prejudice, validity and authenticity
- reflect on the ways in which shared stories connect to personal experiences
- draw conclusions about cause and effect
- recognize the need to change their point of view, decision or conclusion in light of new evidence
- ➢ analyze and synthesize information to create a product
- ➢ record relevant data to acknowledge sources of information
- ➢ use appropriate presentation software to demonstrate personal understandings.

Communication

Students will:

demonstrate skills of oral, visual and textual literacy:

- communicate and interact effectively in a variety of situations
- use appropriate strategies to determine understanding and clarify viewpoints; e.g., paraphrasing, summarizing and questioning
- engage in respectful discussions
- communicate in an engaging manner, using a variety of strategies and skills, e.g., speeches, multimedia presentations and written and oral reports, and consider particular audiences and purposes
- make respectful and reasoned comments on the topic of discussion
- ➢ use communication technology to interact with others
- ➢ use technology to compose, revise and edit text
- ➢ create multimedia presentations that incorporate meaningful graphics, audio, video and text gathered from a variety of sources
- ➢ employ technology to adapt information to a situation, audience and purpose.

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Students will:

develop skills of media literacy:

- examine the values, lifestyles and points of view represented in media messages
- recognize that differences in perspectives can exist in media sources
- examine the impact media has on human thought

➢ understand the nature of various media and the ways in which they are consciously used to influence an audience

➢ assess the authority, reliability and validity of electronically accessed information

➢ analyze the validity of various points of view in media messages

➢ analyze information from multiple sources, evaluating each source in terms of the author's perspective or bias and use of evidence

➢ analyze the impact of various forms of media

➢ demonstrate discriminatory selection of electronically accessed information.

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10-4: LIVING IN A GLOBALIZING WORLD

KEY ISSUE: Should we embrace globalization?

RELATED ISSUE 10-4.1: Should globalization shape identity?

General Outcome

Students will explore the impacts of globalization on their everyday lives.

Specific Outcomes

Values and Attitudes

Students will:

10-4.1a acknowledge and appreciate the existence of alternative viewpoints in a globalizing world (GC, CC)

10-4.1b appreciate why peoples in Canada and other locations strive to promote their cultures, languages and identities in a globalizing world (I, GC, CC)

10-4.1c appreciate how the forces of globalization shape, and are shaped by, identities and cultures (I, GC, CC)

Knowledge and Understanding

Students will:

10-4.1d identify the various ways that people in Canada express their identities; e.g., role modelling, language, religion, spirituality, the arts, clothing, relationship to land, traditions (I, LPP, CC)

10-4.1e explore various understandings of globalization (ER, CC, PADM)

10-4.1f explore the impact of media and communications technology on diversity; e.g., universalization of pop culture, hybridization and diversification (I, GC, CC)

10-4.1g examine the opportunities and challenges presented by globalization to the identities and cultures of peoples in Canada; e.g., acculturation, accommodation, cultural revitalization, affirmation of identity, assimilation, homogenization (I, GC, CC)

10-4.1h examine efforts to promote languages and cultures in Canada in response to globalization; e.g., language laws, cultural content legislation, revitalization of language and culture (I, CC, PADM)

Guiding questions: General guiding questions are provided to support the achievement of outcomes.

- *In what ways do peoples in Canada express their identities?*
- *What are some understandings of globalization in your community? How has globalization affected other communities?*
- *How have various forms of media impacted cultural diversity in Canada?*
- *What impacts does globalization have on cultures?*
- *Does globalization provide opportunities to promote languages and cultures?*

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KEY ISSUE: Should we embrace globalization?

RELATED ISSUE 10-4.2: Should people in Canada respond to the consequences of historical globalization?

General Outcome

Students will explore the effects of historical globalization on indigenous and nonindigenous peoples.

Specific Outcomes

Values and Attitudes

Students will:

10-4.2a recognize and appreciate the historical and contemporary consequences of European contact, historical globalization and imperialism on Aboriginal societies (I, GC, CC, TCC)

10-4.2b exhibit a global consciousness with respect to the human condition (C, GC)

10-4.2c accept social responsibilities associated with global citizenship (C, GC)

10-4.2d recognize and appreciate the validity of histories that are presented in a variety of ways; e.g., oral histories, artwork and illustrations (CC, TCC)

10-4.2e recognize and appreciate various perspectives regarding the prevalence and impacts of Eurocentrism (I, CC, TCC)

Knowledge and Understanding

Students will:

10-4.2f identify the effects of cultural contact between Europeans and indigenous peoples in Canada; e.g., exchange of goods and technologies, depopulation, influences on government (GC, CC, TCC)

10-4.2g identify the foundations of historical globalization; e.g., rise of capitalism, industrialization, imperialism, Eurocentrism (ER, PADM, TCC)

10-4.2h examine multiple perspectives on the political, economic and social impacts of imperialism in Canada (LPP, PADM, TCC)

10-4.2i examine the consequences for Aboriginals of a heritage of imperialism in Canada; e.g., *Indian Act*, consequences of residential schools, social impacts on indigenous peoples (I, GC, CC, TCC)

10-4.2j examine attempts to address the consequences of imperialism in Canada; e.g., *Royal Commission on Aboriginal Peoples*, contemporary examples (GC, PADM, TCC)

10-4.2k examine the legacies of historical globalization and imperialism that continue to influence globalization (GC, TCC)

Guiding questions: General guiding questions are provided to support the achievement of outcomes.

- *How did contact between Europeans and indigenous peoples of Canada shape cultures and institutions?*
- *What is the relationship between industrialization and imperialism? What is the relationship between imperialism and globalization?*
- *How did imperialism shape government policies in Canada?*
- *How have the legacies of imperialism impacted First Nations, Métis and Inuit peoples?*
- *Do the people of Canada have a responsibility to address the legacies of imperialism?*
- *What is the relationship between historical and contemporary globalization?*

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KEY ISSUE: Should we embrace globalization?

RELATED ISSUE 10-4.3: Does globalization contribute to sustainable prosperity for all people?

General Outcome

Students will explore economic, environmental and other impacts of globalization.

Specific Outcomes

Values and Attitudes

Students will:

10-4.3a recognize and appreciate alternative viewpoints in relationships among economics, politics, the environment and globalization (ER, GC, PADM)

10-4.3b recognize and appreciate the impacts of globalization on the interdependent relationships among the economy, people and the environment (ER, GC, PADM)

Knowledge and Understanding

Students will:

10-4.3c explore various understandings of contemporary economic globalization (ER, GC)

10-4.3d examine various factors that contributed to the expansion of globalization since the Second World War; e.g., international organizations, media and transportation technologies, transnational corporations (ER, GC, PADM, TCC)

10-4.3e examine the political and economic challenges and opportunities of globalization; e.g., free trade, foreign investment, economic growth, outsourcing (ER, GC, PADM)

10-4.3f examine multiple perspectives on relationships among people, the land and globalization; e.g., spirituality, stewardship, sustainability, resource development (ER, LPP, GC, CC)

10-4.3g examine the impacts of globalization actions and policies on the environment; e.g., land and resource use, resource development agreements, environmental legislation (ER, LPP, GC)

10-4.3h examine multiple perspectives on sustainability and prosperity in a globalizing world (ER, LPP, CC)

Guiding questions: General guiding questions are provided to support the achievement of outcomes.

- *What are some perspectives on economic globalization in your community?*
- *What are some examples of economic issues in your community that are associated with globalization?*
- *What political and economic opportunities and challenges does globalization present to your community? To Canada?*
- *How does globalization impact the environment?*
- *What are some perspectives on the meaning of prosperity?*
- *What are some perspectives on the relationship between globalization and sustainable prosperity?*

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KEY ISSUE: Should we embrace globalization?

RELATED ISSUE 10-4.4: How should I, as a citizen, respond to globalization?

General Outcome

Students will examine their roles and responsibilities as citizens in a globalizing world.

Specific Outcomes

Values and Attitudes

Students will:

10-4.4a recognize and appreciate the impact of globalization on the quality of life of individuals and communities (C, GC)

10-4.4b recognize and appreciate the importance of human rights in determining quality of life (C, GC)

10-4.4c accept the political, social and environmental responsibilities associated with global citizenship (C, ER, GC)

Knowledge and Understanding

Students will:

10-4.4d explore various understandings of quality of life (GC)

10-4.4e examine the impacts of globalization on children and youth; e.g., awareness of global issues, employment issues, identity (C, ER, GC, PADM)

10-4.4f examine the impacts of globalization on women; e.g., gender issues, labour issues (C, ER, GC, PADM)

10-4.4g examine relationships between globalization and the expansion of democracy and human rights (GC, PADM)

10-4.4h examine the ways in which globalization affects individuals and communities; e.g., migration, technology, agricultural issues, pandemics, resource and contemporary issues (GC, CC)

10-4.4i explore the means by which individuals, governments, organizations and businesses in Canada could address the opportunities and challenges of globalization; e.g., proglobalization activism, antiglobalization activism, legislation, agreements, consumer activism, corporate responsibility (C, ER, GC, PADM)

10-44j identify strategies to demonstrate active and responsible citizenship in workplace, community and global contexts (C, ER, GC, PADM)

Guiding questions: General guiding questions are provided to support achievement of outcomes.

- *What are some understandings of quality of life?*
- *How has globalization impacted the quality of life for youth in your community? In Canada? In other countries?*
- *How has globalization impacted the quality of life for women in your community? In Canada? In other countries?*
- *Does globalization promote human rights and democracy?*
- *How has globalization impacted the quality of life in communities in Canada? In other countries?*
- *How can individuals, groups, businesses and governments act to improve the quality of life of others?*
- *In what ways can I respond to globalization through active and responsible citizenship in workplace, community and global contexts?*

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20-4: Nationalism in Canada and the World

Overview

Students will examine various forms of nationalism and apply their perceptions to their own identity and sense of citizenship. They will investigate the influence of nationalism on historical and contemporary events. Students will explore the impacts of nationalism and internationalism. The infusion of multiple perspectives will allow students to develop understandings of First Nations, Métis, Inuit and Francophone perspectives on nationalism.

Community partnerships and the study of local and current events provide additional opportunities to enhance citizenship by connecting in-school learning experiences to everyday living experiences outside of school. Community partnerships may include inviting guest speakers into the classroom, hosting cultural awareness activities, visiting community agencies/businesses and taking part in community events/activities.

Rationale

As perspectives on nationalism evolve, so do perspectives on personal identity and on what it means to be a member of a collective, state and nation. This evolution is significant in the Canadian context as nationalism continues to shape visions of Canada and the Canadian identity. Understanding the significance of nationalism contributes to an awareness and understanding of various perspectives on the interrelationships among nationalism, internationalism, citizenship and identity.

Key Issue	**Key Outcome**
Should we embrace nationalism?	**Students will understand, assess and respond to the complexities of nationalism.**
Related Issues	**General Outcomes**
20-4.1 *Should nation be the foundation of identity?*	Students will explore the relationships among nation, identity and nationalism.
20-4.2 *Should nations pursue the national interest?*	Students will examine the effects of nationalism, ultranationalism and the pursuit of the national interest.
20-4.3 *Should internationalism be pursued?*	Students will examine effects of the pursuit of internationalism.
20-4.4 *Should individuals and groups in Canada embrace a national identity?*	Students will examine the complexities of nationalism within the Canadian context.

Local and Global Current Affairs

In order to provide opportunities for students to connect their environments to the world beyond, the program of studies provides the flexibility to examine local current issues and concerns within the time allotted for social studies.

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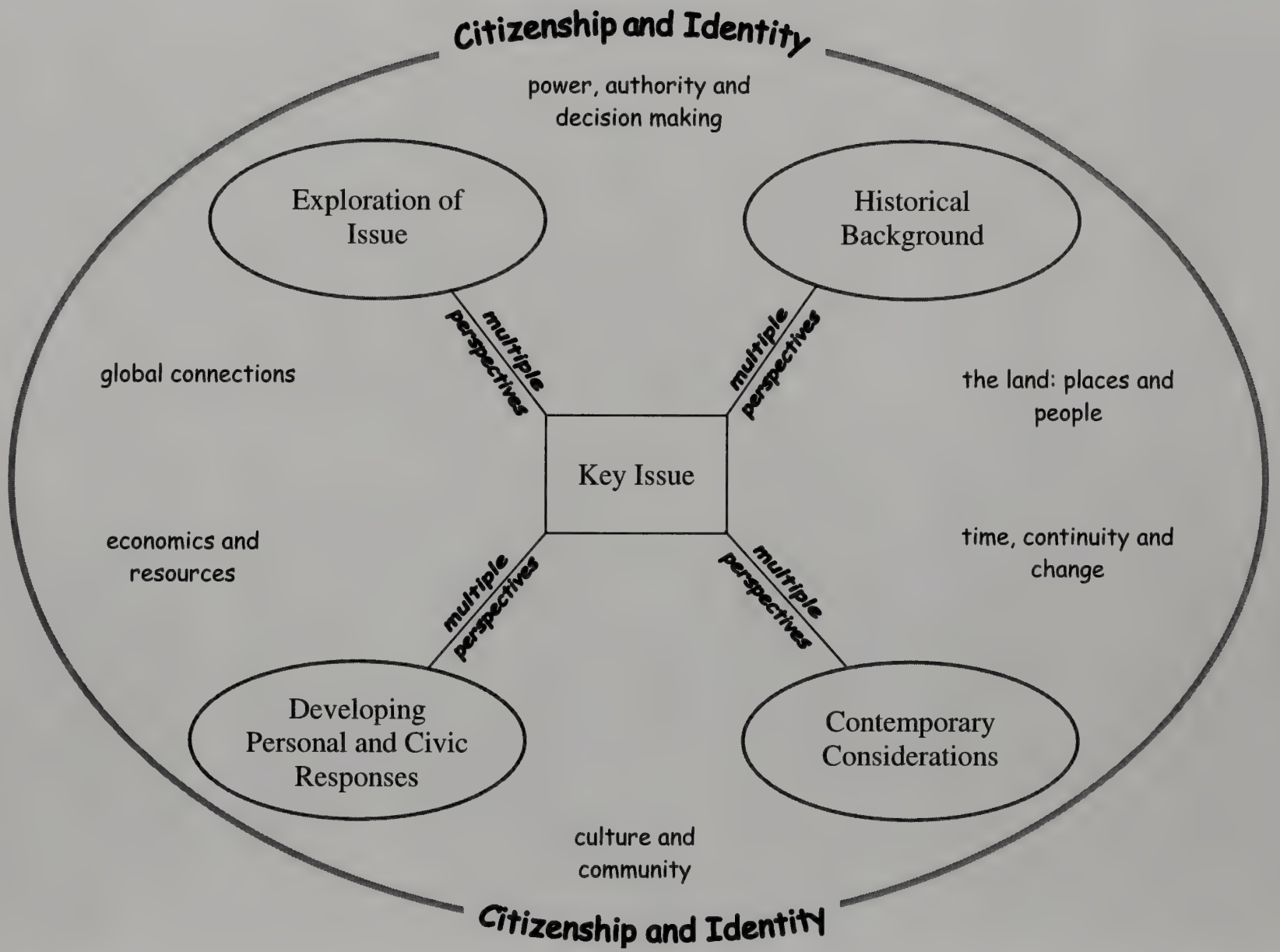

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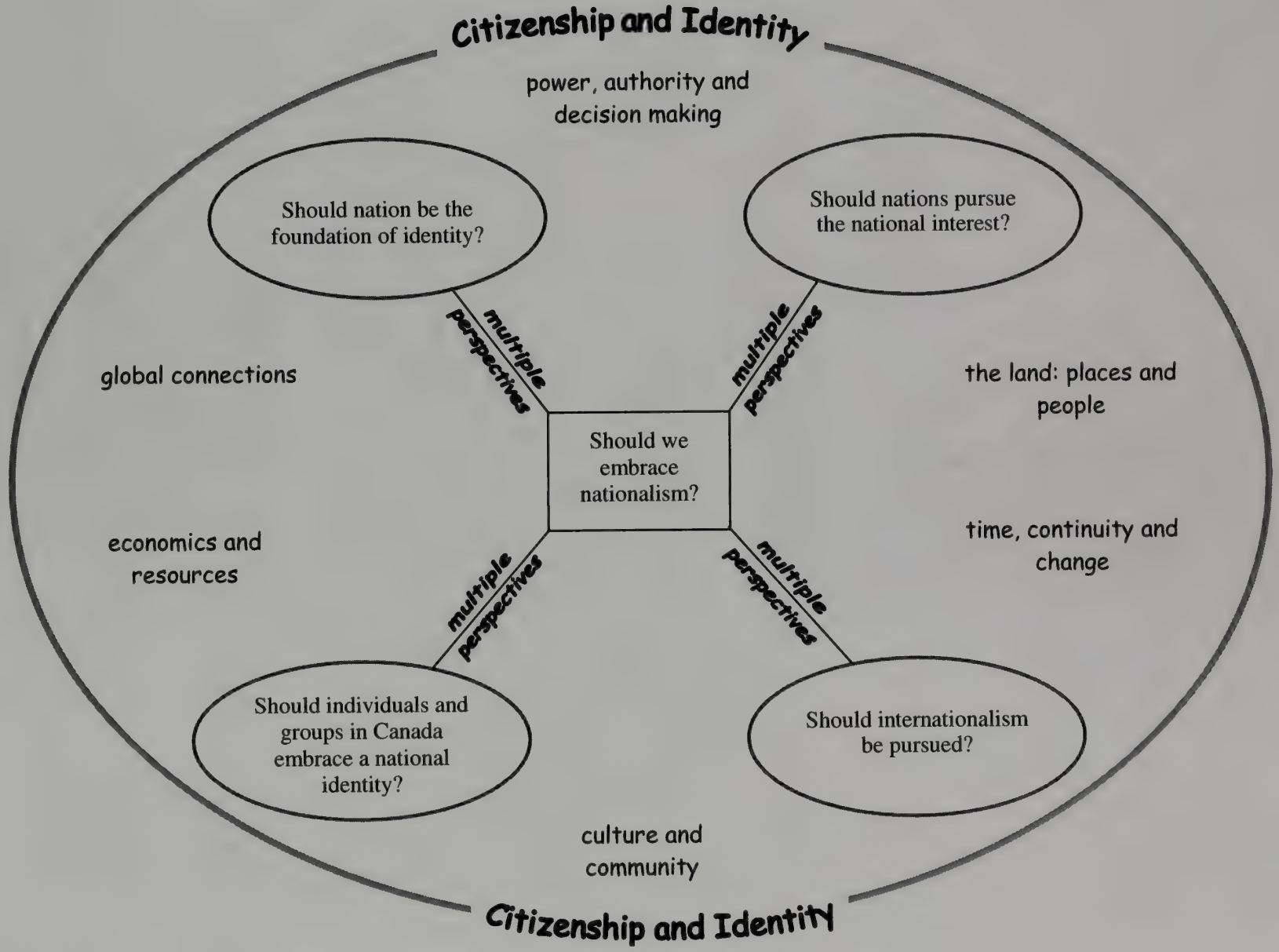

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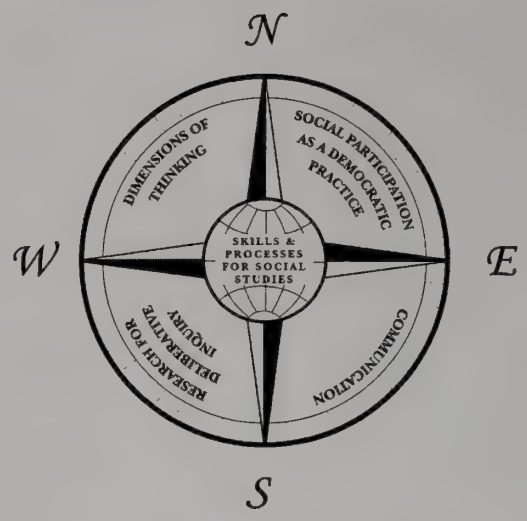

Benchmark Skills and Processes

The following benchmark skills and processes are outcomes to be achieved by the end of Knowledge and Employability Social Studies 20-4.

Dimensions of Thinking	
critical and creative thinking	Use an issue-analysis model to identify and define an issue or question, examine and evaluate several positions and formulate and defend a personal position.
historical thinking	Examine historical events/issues and their relationship to the present.
geographic thinking	Examine the impact of physical and human geography on history.
decision making and problem solving	Use a problem-solving model to identify the problem/issue, identify alternative solutions, consider the consequences of acting on each and choose, plan and defend a course of action and/or a decision.
Social Participation as a Democratic Practice	
cooperation, conflict resolution and consensus building	Work positively and collaboratively with others by considering their needs and perspectives and using appropriate strategies to solve conflicts.
age-appropriate behaviour for social involvement	Engage in age-appropriate actions to enhance personal and community well-being.
Research for Deliberative Inquiry	
research and information	Apply a research process to access, select, organize, record, examine and interpret ideas and information.
Communication	
oral, visual and textual literacy	Communicate effectively, using appropriate print and nonprint text forms and technologies and considering audience and purpose.
media literacy	Demonstrate understanding of the nature of media and how media influences an audience.

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SKILLS AND PROCESSES

The following skills and processes are to be developed within the contexts of the general and specific outcomes included in 20-4.1, 20-4.2, 20-4.3 and 20-4.4.

Alberta Education's Information and Communication Technology (ICT) curriculum is infused throughout social studies. Selected ICT outcomes are indicated by this symbol ➢.

SPECIFIC OUTCOMES

Dimensions of Thinking

Students will:

develop skills of critical and creative thinking:

- use an issue-analysis model to identify and define an issue or question, examine and evaluate several positions and formulate and defend a personal position
- re-evaluate their personal assumptions and opinions to reflect a broadened understanding of a topic or issue
- identify the main ideas underlying a position or issue
- investigate local and global current events from a variety of perspectives and examine how these perspectives can shape understanding
- examine the validity of information, based on context, bias, sources, objectivity, evidence and reliability
- demonstrate informed and ethical decision-making skills
- examine ways in which a society's culture may be reflected in a variety of forms; e.g., artwork, oral stories and dance.

Students will:

develop skills of historical thinking:

- examine diverse historical and contemporary perspectives within and across cultures
- summarize the key events of a specific time period and place those events in historical contexts; e.g., timelines or charts
- examine historical events/issues and their relationships with the present
- examine the difference between various historical facts and interpretations
- ➢ use current, reliable information sources from around the world.

Students will:

develop skills of geographic thinking:

- examine the ways in which natural and man-made geographic features influence world events
- use, construct and interpret maps to broaden their understanding of geography, using technology as appropriate
- draw conclusions from maps and other geographic sources
- examine the impact of human activities on the land and the environment
- ➢ access and operate multimedia applications and technologies from stand-alone and online sources
- ➢ use a variety of technologies to assist in the preparation of maps.

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Students will:

demonstrate skills of decision making and problem solving:

- use a problem-solving model to identify the problem/issue, identify alternative solutions, consider the consequences of acting on each and choose, plan and defend a course of action and/or a decision
- reflect on their own and others' past actions when determining future actions and choices
- recognize that some problems may not have apparent or visible solutions
- ➢ describe a plan of action that uses technology to solve a problem
- ➢ use the appropriate tools and materials required to accomplish a plan of action
- ➢ evaluate the appropriateness of the technology used to investigate or solve a problem.

Social Participation as a Democratic Practice

Students will:

demonstrate skills of cooperation, conflict resolution and consensus building:

- consider the needs and perspectives of others
- reflect on their own perspectives, based on new information from other perspectives
- work positively and collaboratively with others
- listen attentively to others
- demonstrate leadership by persuading, compromising and negotiating to resolve conflicts and differences to reach group consensus
- identify and use appropriate strategies to resolve conflicts peacefully and equitably
- use peer and self-evaluations to set attainable goals to improve learning.

Students will:

demonstrate age-appropriate behaviour for social involvement as respectful and responsible citizens contributing to the community:

- respond respectfully to the inherent meanings of artistic, musical, literary and other representations of culture and history
- participate in a community to protect and affirm their identities, as appropriate
- plan, evaluate and implement actions that support fairness, justice and equality
- support environmental stewardship; e.g., recycling and reducing consumption
- ➢ develop a plan of action to use technology to solve a problem.

Research for Deliberative Inquiry

Students will:

apply research processes:

- pose questions to direct inquiry and research processes and formulate new questions as research progresses
- access and select different points of view, using a variety of sources
- locate information by using the various parts of an information source; e.g., glossary, table of contents and index
- draw upon visual, literary, musical and auditory sources when inquiring into questions and issues; e.g., Aboriginal experiences
- practise responsible and ethical use of information and technology
- create and conduct a plan for an inquiry that includes time management

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- ➢ plan and perform searches using more than one electronic source
- ➢ use calendars and time and/or project management software to assist in organizing the research process
- ➢ refine searches to limit sources to a manageable number
- ➢ select information from appropriate sources, including primary and secondary sources
- identify and record the main ideas in information sources
- organize information using a variety of strategies and tools; e.g., graphs, charts, graphic organizers and technology as appropriate
- distinguish fact from opinion in a variety of information sources; e.g., media reports and accounts
- compare various interpretations, using a variety of evidence; e.g., photographs, artifacts, storytellers and interviews
- observe and interpret trends and relationships using tables and graphs
- interpret ideas and information to compare and contrast perspectives; e.g., bias, racism, prejudice, validity and authenticity
- reflect on the ways in which shared stories connect to personal experiences
- draw conclusions about cause and effect
- recognize the need to change their point of view, decision or conclusion in light of new evidence
- ➢ analyze and synthesize information to create a product
- ➢ record relevant data to acknowledge sources of information
- ➢ use appropriate presentation software to demonstrate personal understandings.

Communication

Students will:

demonstrate skills of oral, visual and textual literacy:

- communicate and interact effectively in a variety of situations
- use appropriate strategies to verify understanding and clarify viewpoints; e.g., paraphrasing, summarizing and questioning
- engage in respectful discussions
- communicate in an engaging manner, using a variety of strategies and/or skills, e.g., speeches, multimedia presentations and written and oral reports, and consider particular audiences and purposes
- make respectful and reasoned comments on the topic of discussion
- use communication technology to interact with others
- use technology to compose, revise and edit text
- create multimedia presentations that incorporate meaningful graphics, audio, video and text gathered from a variety of sources
- ➢ employ technology to adapt information to a situation, audience and purpose.

Students will:

develop skills of media literacy:

- examine the values, lifestyles and points of view represented in media messages
- recognize that differences in perspectives can exist in media sources
- examine the impact media has on human thought
- ➢ understand the nature of various media and the ways in which they are consciously used to influence an audience

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- assess the authority, reliability and validity of electronically accessed information
- analyze the validity of various points of view in media messages
- analyze information from multiple sources, evaluating each source in terms of the author's perspective or bias and use of evidence
- analyze the impact of various forms of media
- demonstrate discriminatory selection of electronically accessed information.

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20-4: NATIONALISM IN CANADA AND THE WORLD

KEY ISSUE: Should we embrace nationalism?

RELATED ISSUE 20-4.1: Should nation be the foundation of identity?

General Outcome

Students will explore the relationships among nation, identity and nationalism.

Specific Outcomes

Values and Attitudes

Students will:

20-4.1a appreciate that understandings of identity, nation and nationalism continue to evolve (C, I)
20-4.1b appreciate the existence of alternative viewpoints on the meaning of nation (C, I)
20-4.1c appreciate how the forces of nationalism have shaped, and continue to shape, Canada and the world (I, TCC)
20-4.1d appreciate why peoples seek to promote their identity through nationalism (C, I)

Knowledge and Understanding

Students will:

20-4.1e explore a range of expressions of nationalism (C, I)
20-4.1f develop understandings of nation and nationalism; e.g., relationship to land, geographic, collective, civic, ethnic, cultural, linguistic, political, religious (I, LPP, CC)
20-4.1g examine relationships among nations, states and nation–states (C, I, PADM, TCC)
20-4.1h examine nationalism as an internalized feeling, collective consciousness and/or identity shared by a people; e.g., Canadian nationalism, Québécois nationalism, First Nations and Métis nationalism, Inuit perspectives (C, I, TCC)
20-4.1i examine the relative importance of reconciling contending nationalist loyalties; e.g., First Nations and Métis nationalism, Inuit perspectives, ethnic nationalism in Canada, Canadian nationalism (C, I, TCC)

Guiding questions: General guiding questions are provided to support the achievement of outcomes.

- *What traditions, symbols and actions may be expressions of nationalism?*
- *What are some understandings of nationalism in your community?*
- *How do individuals and groups express nationalism?*
- *Why are some Aboriginal peoples referred to as First Nations?*
- *What role does citizenship or membership in a nation play in your identity? What role should it play?*
- *Is it possible to be a citizen of more than one nation?*

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KEY ISSUE: Should we embrace nationalism?

RELATED ISSUE 20-4.2: Should nations pursue the national interest?

General Outcome

Students will examine the effects of nationalism, ultranationalism and the pursuit of the national interest.

Specific Outcomes

Values and Attitudes

Students will:

20-4.2a appreciate that nations and states pursue the national interest (GC, PADM, TCC)

20-4.2b appreciate multiple perspectives related to the pursuit of the national interest (TCC)

Knowledge and Understanding

Students will:

20-4.2c explore a range of expressions of national interest (I, ER, LPP, PADM, TCC)

20-4.2d explore the relationship between nationalism and the pursuit of the national interest (I, PADM)

20-4.2e examine similarities and differences between nationalism and ultranationalism (I, PADM)

20-4.2f identify the effects of nationalism and ultranationalism during times of conflict; e.g., examples of nationalism and ultranationalism from the First and Second World Wars, internments in Canada (GC, PADM, TCC)

20-4.2g examine ultranationalism as a cause of genocide; e.g., the Holocaust (GC, PADM, TCC)

20-4.2h examine the relationship between nationalism and national self-determination; e.g., Québécois nationalism and the sovereignty movement; First Nations, Métis and Inuit self-government; contemporary examples (ER, LPP, PADM, TCC)

Guiding questions: General guiding questions are provided to support the achievement of outcomes.

- *What motivates nations and states to act in their own interests?*
- *What are some expressions of national interest?*
- *What roles can nationalism and ultranationalism play in conflict?*
- *Why do nations seek self-determination?*

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KEY ISSUE: Should we embrace nationalism?

RELATED ISSUE 20-4.3: Should internationalism be pursued?

General Outcome

Students will examine the effects of the pursuit of internationalism.

Specific Outcomes

Values and Attitudes

Students will:

20-4.3a express an interest in current events and world affairs (C, GC)

20-4.3b appreciate the relationships among human beings in an interdependent world (C, GC)

20-4.3c demonstrate understanding of a global consciousness of the human condition and world affairs (C, GC)

Knowledge and Understanding

Students will:

20-4.3d explore understandings of internationalism (GC, PADM)

20-4.3e explore the motives of nation- and state-involvement in international affairs; e.g., economic stability, self-determination, peace, security and humanitarianism (LPP, GC, PADM, TCC)

20-4.3f explore how internationalism can be promoted by foreign policy; e.g., peacekeeping, foreign aid (GC, PADM)

20-4.3g examine the extent to which organizations promote internationalism; e.g., United Nations, World Council of Indigenous Peoples, European Union, l'Organisation internationale de la Francophonie (C, LPP, GC)

20-4.3h examine how the pursuit of internationalism impacts attempts to address contemporary issues; e.g., conflict, poverty, environment, human rights (ER, GC, PADM)

Guiding questions: General guiding questions are provided to support the achievement of outcomes.

- *Why does Canada interact with other countries?*
- *What motivates nations and states to engage in or withdraw from international affairs?*
- *How do various international organizations attempt to promote internationalism?*
- *What are some contemporary examples of internationalism being used to address issues?*

	C Citizenship			I Identity	
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
CC	Culture and Community	PADM	Power, Authority and Decision Making	TCC	Time, Continuity and Change

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KEY ISSUE: Should we embrace nationalism?

RELATED ISSUE 20-4.4 Should individuals and groups in Canada embrace a national identity?

General Outcome

Students will examine the complexities of nationalism within the Canadian context.

Specific Outcomes

Values and Attitudes

Students will:

20-4.4a appreciate historical and contemporary attempts to develop a national identity (C, I, TCC)

20-4.4b appreciate contrasting historical and contemporary narratives associated with national identity (C, I, TCC)

20-4.4c respect the views of others on alternative visions of national identity (C, I)

Knowledge and Understanding

Students will:

20-4.4d explore multiple perspectives on national identity in Canada (C, I)

20-4.4e explore methods used by individuals, groups and governments in Canada to promote a national identity; e.g., national symbols, institutions, government programs (C, I)

20-4.4f identify historical perspectives of Canada as a nation; e.g., Fathers of Confederation, First Nations treaties and the *Indian Act*, Métis and Inuit self-governance, Pierre Trudeau (I, CC, TCC)

20-4.4g explore the challenges and opportunities associated with the promotion of Canadian national unity; e.g., Québec sovereignty, federal–provincial–territorial relations, Aboriginal self-determination and land claims, bilingualism and multiculturalism (C, I, CC)

20-4.4h examine various perspectives on future visions of Canada; e.g., pluralism, multination model, separatism, global leader, Aboriginal self-determination, North American integration (I, LPP, CC)

20-4.4i develop personal and collective visions of national identity (C, I)

Guiding questions: General guiding questions are provided to support the achievement of outcomes

- *What traditions and symbols are expressions of identity in Canada?*
- *What techniques are used to promote identity in Canada?*
- *How have historical perspectives on nation shaped Canada?*
- *What are some contemporary challenges to Canadian national unity? What opportunities exist to promote Canadian national unity?*
- *What are some visions for a future Canadian identity?*
- *What is your vision of Canadian identity?*

	C Citizenship			I Identity	
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
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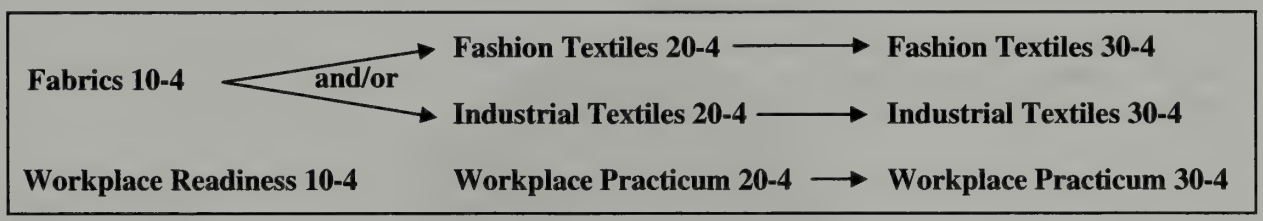
KNOWLEDGE AND EMPLOYABILITY
FABRICS

COURSE SEQUENCE



Knowledge and Employability 10-level courses provide opportunities for *exploration* of, and *orientation* toward, an occupational grouping in a single career field. In 20-level courses, students progress from *orientation* toward *preparation*, and in 30-level courses students are involved in *preparation* for direct job entry.

Fabrics courses are designed to teach occupational knowledge and skills for entry-level positions in fashion and industrial textiles by developing employability competencies that relate to all career paths.

- All courses focus on developing career awareness, safety standards and knowledge of tools, equipment and materials related to the industry.
- Fabrics 10-4 provides a basis for, and an introduction to, Fashion Textiles 20-4 and Industrial Textiles 20-4.
- Fashion Textiles 20-4 and 30-4 focus on pattern selection and garment construction.
- Industrial Textiles 20-4 and 30-4 focus on laundering, repairing and constructing various fabrics for a variety of projects in industry and in the home.
- Students interested in fabrics should be encouraged to take both courses at the 20 and 30 levels.
- Students interested in fashion textiles should be encouraged to take courses in the Art/Design and Communication sequence to further develop their design knowledge and skills.
- A related Workplace Practicum or Work Experience course is recommended to further enhance employability and occupational skills and to adequately prepare students for entry into the work force. In senior high school, a 30-level Workplace Practicum course, 30-level Work Experience course or 30-level Green Certificate course is required to fulfill the requirements of a Certificate of High School Achievement. Workplace practicums are supportive work placements in a related field that will allow students to validate their learning in the workplace.

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COURSE DELIVERY

This Knowledge and Employability occupational strand includes two sequences of 5-credit courses. Students progress through the courses in a sequence and may combine courses across sequences to increase the depth of their knowledge.

The 10-level course is a prerequisite for any of the 20-level courses in the strand. The 20-level course in each sequence is a prerequisite for the 30-level course in that sequence.

The occupational courses may be offered in a variety of learning environments that range from a classroom in a school to a business/industry work site. The courses offer a balance between school-based and work-based learning that provides options for students to enter the workplace or to pursue post-secondary education or training.

GOALS

Students in Knowledge and Employability occupational courses will:

- identify standards determined by the workplace for the academic and occupational competencies considered necessary for success
- demonstrate practical applications through on- and off-campus experiences/community partnerships
- experience career development to assist them in exploring careers, assessing their career skills and developing a career-focused portfolio
- develop interpersonal skills to ensure respect, support and cooperation with others
- develop safety awareness and habits to ensure a safe working environment.

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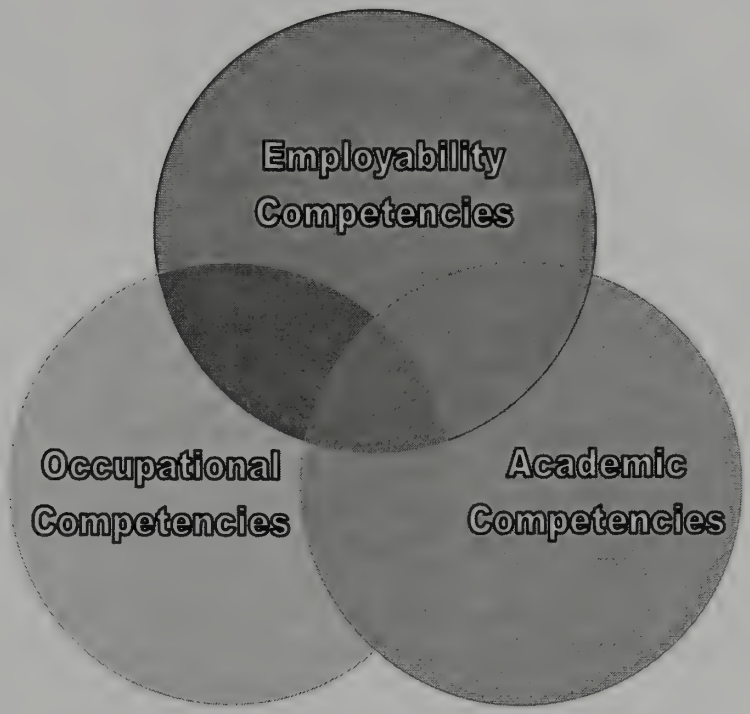
COMPETENCIES FRAMEWORK

Each Knowledge and Employability occupational course is made up of three elements: employability, occupational and academic competencies. The combination of these three elements is essential to the delivery of the occupational courses.

- Employability competencies are transferable to all occupations and are consistent throughout all courses.
- Occupational competencies are specific to an occupational area and provide the context through which students will develop their employability competencies.
- Academic competencies are to be reinforced and further developed through the occupational context that provides relevance to the academic courses.

The integration of the three elements is essential to equip students to make the transition from school to the workplace.

KNOWLEDGE AND EMPLOYABILITY OCCUPATIONAL COURSES COMPETENCIES FRAMEWORK



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FABRICS 10-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will develop an awareness of how learning contributes to personal success. • Students will develop an ability to manage change effectively. • Students will explore and discover personal aptitudes and interests related to occupational opportunities.
Personal Management	• Students will develop self-esteem, confidence and the ability to set personal goals and priorities. • Students will identify and understand the risks associated with occupational activities.
Working with Others	• Students will develop communication skills and strategies in an occupational context. • Students will demonstrate respect for the thoughts and opinions of others in the group. • Students will demonstrate positive effort and behaviour toward achieving a group's goals.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will explore a variety of occupations within a fabrics career environment. • Students will develop basic safe workplace practices and procedures. • Students will be introduced to technology to develop a high-quality product or service. • Students will identify procedures used for the care and maintenance of fabrics and articles of clothing. • Students will develop basic knowledge of, and the skills required to properly use, the tools, equipment and materials used in clothing construction.
Ensuring Quality	• Students will develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will enhance their ability to listen, speak, read and write effectively.
Thinking	• Students will develop problem-solving strategies.
Numeracy	• Students will understand the value of numeracy skills in the workplace.
Information Technology	• Students will familiarize themselves with the information technology used in daily workplace operation.

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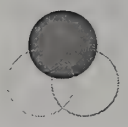

EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will develop an awareness of how learning contributes to personal success.	**Lifelong Learning** *Students will:* • identify learning preferences and strengths and apply learning styles and strategies appropriate to the situation • set learning goals and identify how formal/informal learning can help them achieve goals • develop an awareness of senior high school courses and work experience and identify educational possibilities; e.g., Registered Apprenticeship Program (RAP), Green Certificate, Career and Technology Studies (CTS) and Career Internship.
Students will develop an ability to manage change effectively.	**Adapting to Change** *Students will:* • identify available support resources and assess potential barriers • prepare an action plan to proactively respond to a particular change or challenge.
Students will explore and discover personal aptitudes and interests related to occupational opportunities.	**Career Development** *Students will:* • create an inventory of personal competencies, interests, goals and work preferences and link this inventory to career options • identify sources of support for investigating and finding work; e.g., Alberta Learning Information Service (ALIS) Web site (http://www.alis.gov.ab.ca) • describe how work contributes to individual goals • explore the workplace through community partnerships and identify employer and employee expectations, rights and responsibilities.

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PERSONAL MANAGEMENT

General Outcomes	Specific Outcomes
Students will develop self-esteem, confidence and the ability to set personal goals and priorities.	**Self-development** *Students will:* • identify personal characteristics, strengths and talents and establish an action plan to build on them • recognize the use of strengths and talents to achieve goals • identify acceptable and appropriate behaviours and present themselves to suit an activity or role; e.g., body language, grooming, clothing, manners • describe personal beliefs about what is right and wrong and assess the consequences of ethical/unethical behaviours.
Students will identify and understand the risks associated with occupational activities.	**Risk Management** *Students will:* • identify current health and safety procedures; e.g., at home, at school, in the community and in the workplace • identify risks that could impact themselves and others and identify hazards in the work environment; e.g., chemical, physical, biological and ergonomic • identify a potential emergency situation and develop strategies for personal emergency responses • identify sources of support when taking risks in their personal lives and in the workplace; e.g., entrepreneurship.

WORKING WITH OTHERS

Students will develop communication skills and strategies in an occupational context.	**Interpersonal Communication** *Students will:* • demonstrate appropriate communication strategies for communicating thoughts and feelings; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate language and body language • develop awareness of verbal and nonverbal communication strategies • improve their ability to communicate by working with others • communicate common goals and expectations to improve their team's ability to achieve goals • identify causes of conflict.

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General Outcomes	Specific Outcomes
Students will demonstrate respect for the thoughts and opinions of others in the group.	**Building Community** *Students will:* • identify commonly accepted courteous behaviour • assess and respect how their personal values and beliefs differ from those of others and how those beliefs impact personal behaviour • identify the value of volunteering in community activities; e.g., charity work, community car wash.
Students will demonstrate positive effort and behaviour toward achieving a group's goals.	**Teamwork** *Students will:* • identify team goals • work independently and with others to support team goals; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • establish short- and long-term team goals.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will explore a variety of occupations within a fabrics career environment.	**Career Awareness** **Exploration** *Students will:* • identify local opportunities within a career field • define and recognize entrepreneurship as a potential career path • research employment information; e.g., duties, working conditions, personal characteristics, education, salary • identify related jobs/services in the community; e.g., – seamstress – alteration and repair – laundering and dry cleaning – upholstery – machine embroidery – drapery – home decorating – interior design – cottage industries. **Standards** *Students will:* • identify workplace protocols, procedures and standards of conduct; e.g., – clean the entire work area, return tools to designated areas, minimize the waste of materials – identify related health and sanitation standards – display punctuality and come prepared for classroom and laboratory activities – treat the laboratory area with care and with attention to potential workplace health and safety risks – treat other members of the team with respect – use appropriate language and terminology – wear appropriate dress.

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General Outcomes	Specific Outcomes
Students will develop basic safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify and demonstrate preventive measures to avoid accidents and injury to themselves and others; e.g., – identify safety device locations in the laboratory or classroom; e.g., eyewash station, emergency shut-off, fire extinguisher, emergency exits, telephone – demonstrate the correct procedures for addressing injuries – identify the proper use of tools with regard to other classmates and laboratory conditions – identify personal protective equipment (PPE) – demonstrate proper body position while at a work station – maintain a safe and clean work area – identify and practise the safe use of electrical equipment • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements.
Students will be introduced to technology to develop a high-quality product or service.	**Products and Service** **Technology Integration** *Students will:* • explore new and emerging products and technological advances used in the field of fabrics. **Providing Service** *Students will:* • identify client relationships or interactions within the field of fabrics • identify services needed, required or provided • collect necessary information to complete a purchase or to fill out a work order • identify the importance of customer or client service to all businesses/industries • identify professional practices and work habits • strive to meet and exceed the client's expectations.
Students will identify procedures used for the care and maintenance of fabrics and articles of clothing.	**Textiles and Their Care** **Textile Classification** *Students will:* • identify textiles and fibre classifications; i.e., – natural: plants, animal fibres – man-made: regenerated and synthetic fibres.

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General Outcomes	Specific Outcomes
	Construction Methods *Students will:* • identify construction method; e.g., – weaving: plain, twill, satin – knitting: single knit, double knit – crocheting – netting – braiding – felting/fibre bonding • complete a simple construction project; e.g., toque, scarf, placemats. **Fabric Identification** *Students will:* • identify various fabrics and their characteristics; e.g., broadcloth, corduroy, denim • determine fibre identification through experiential methods; e.g., burning test, microscopic test, feel test. **Care Labelling** *Students will:* • interpret care labels • identify international care symbols. **Care of Fabrics** *Students will:* • identify processes and techniques for the proper care of fabrics; e.g., – laundering – dry cleaning – pressing and ironing.
Students will develop basic knowledge of, and the skills required to properly use, the tools, equipment and materials used in fabrics construction.	**Construction Basics** **Tools and Equipment** *Students will:* • identify and demonstrate the safe use of related tools, equipment and materials; e.g., – cutting: scissors, shears, rotary cutters, stitch/seam ripper – measuring: tape measure, seam gauge – pinning: pins, pin cushions, magnets – stitching: needles, thimbles – marking: fabric marking pens, tracing wheels, paper, chalk.

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The Sewing Machine

Students will:

- identify the parts of a sewing machine
- identify and demonstrate procedures for the safe operation of a sewing machine; e.g.,
  - winding the bobbin
  - threading the machine and bobbin
  - replacing the needle, presser foot and slide plate
  - using the hand wheel and the movements of the feed dogs
  - using the presser foot
  - recognizing the proper stitch and tension required
  - backstitching
  - using different machine stitches
  - resolving machine problems
- follow the procedures for machine stitching; e.g., identify procedures for adjusting stitch length and tension
- identify procedures for machine care and cleaning.

The Serger

Students will:

- identify the differences between a serger and a conventional sewing machine
- identify a serger's parts and their functions
- describe and demonstrate safe serger operating procedures; e.g.,
  - threading
  - basic serging guidelines
  - chaining off
  - securing seams
- identify procedures for serger care and cleaning
- identify and demonstrate basic seams and seam finishes; e.g.,
  - seams: plain and serged, intersecting
  - finishes: zigzagged, serged, pinked and clean-finished
  - reducing bulk: clipping, notching and grading
  - pressing tools: irons, hams, seam rolls
  - pressing techniques: pressing versus ironing.

Seams and Pressing

Students will:

- demonstrate simple sewing/serger projects; e.g., pencil/make-up case, tote bag, purse, CD case, windsock, locker organizer, dorm pants, shorts, sweat pants, hoody, T-shirt.

Application

Students will:

- insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will enhance their ability to listen, speak, read and write effectively.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret information presented in a variety of forms, including texts, videos, graphs, charts, diagrams, manuals • identify a purpose for writing • print or write legibly, spell accurately and apply rules of grammar to construct text • listen and ask questions to expand information and to appreciate the points of view of others.

THINKING

Students will develop problem-solving strategies.	**Problem Solving** *Students will:* • identify and define, and ask relevant questions to clarify, the problem • evaluate the results in terms of expected outcomes.

NUMERACY

Students will understand the value of numeracy skills in the workplace.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion to solve problems in a meaningful context • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

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INFORMATION TECHNOLOGY

General Outcomes	Specific Outcomes
Students will familiarize themselves with the information technology used in daily workplace operation.	**Computer Operations** *Students will:* • identify the most appropriate technology tool for the task; e.g., fax, e-mail, networks, telephone • identify appropriate telephone operations; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • identify basic computer operations; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • identify procedures for connecting and using audio, video and digital equipment • identify procedures for sending and receiving faxes and setting up a fax machine • identify procedures for copying and printing documents.

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FASHION TEXTILES 20-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will apply their abilities and interests toward achieving learning goals. • Students will practise the skills and abilities needed to manage change. • Students will orient themselves toward an occupation that reflects their personal aptitudes and interests.
Personal Management	• Students will increase their self-esteem and confidence and enhance their ability to set personal goals and priorities. • Students will understand risks and be accountable for their actions.
Working with Others	• Students will practise effective communication skills and strategies in an occupational context. • Students will demonstrate the ability to understand and work within the culture of a group. • Students will plan and make decisions with others.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will orient themselves toward an occupation within a fashion textiles career environment. • Students will demonstrate basic safe workplace practices and procedures. • Students will develop an increased awareness of technology to develop a high-quality product or service. • Students will develop an understanding of sewing patterns. • Students will identify various trends in the field of fashion. • Students will develop skills in the merchandising and marketing of clothing.
Ensuring Quality	• Students will continue to develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will demonstrate effective listening, speaking, reading and writing skills.
Thinking	• Students will apply creative thinking skills to solve problems.
Numeracy	• Students will apply mathematical concepts to solve occupational problems.
Information Technology	• Students will enhance their performance by using information technology to help complete tasks.

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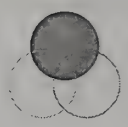

EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will apply their abilities and interests toward achieving learning goals.	**Lifelong Learning** *Students will:* • relate learning preferences and strengths to formal and informal learning opportunities and identify post-secondary opportunities within the related field • assess learning goals and current competencies, identify competencies needing development and identify and prioritize learning goals • create a pathway of senior high school courses to reflect learning goals • identify educational possibilities; e.g., Registered Apprenticeship Program (RAP), Green Certificate, Career and Technology Studies (CTS) and Career Internship.
Students will practise the skills and abilities needed to manage change.	**Adapting to Change** *Students will:* • identify goals, responsibilities and commitments • assess and reflect on the success of an action plan; e.g., – create alternative choices to deal with unexpected change – identify stressors in personal environments that they can and cannot change • identify the need for personal support and create an inventory of available personal and community sources of support.
Students will orient themselves toward an occupation that reflects their personal aptitudes and interests.	**Career Development** *Students will:* • assess work preferences and nonpreferences (e.g., indoor, outdoor, shift work), assess life/work options and outline career goals and paths • work in and seek out a variety of roles and responsibilities • measure and celebrate personal contributions to workplace goals; e.g., paid, unpaid or volunteer work • orient themselves to the workplace through community partnerships and assess personal performance in terms of workplace expectations.

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PERSONAL MANAGEMENT

General Outcomes	Specific Outcomes
Students will increase their self-esteem and confidence and enhance their ability to set personal goals and priorities.	**Self-development** *Students will:* • re-evaluate an action plan to develop strengths and talents • use strengths and talents to achieve personal goals • clarify acceptable and appropriate behaviours for specific activities and roles • act ethically in personal, community and workplace contexts and accept the consequences of their actions.
Students will understand risks and be accountable for their actions.	**Risk Management** *Students will:* • follow health and safety procedures; e.g., at home, at school, in the community and in the workplace • identify potential hazards, take corrective action and develop and practise action plans to ensure safety • practise personal emergency responses • assess their comfort level with, and the consequences of, taking risks.

WORKING WITH OTHERS

Students will practise effective communication skills and strategies in an occupational context.	**Interpersonal Communication** *Students will:* • assess the effectiveness of communication strategies used to communicate thoughts and feelings; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate body language • assess verbal and nonverbal communication strategies • apply social norms to build specific relationships • demonstrate the ability to accept praise and/or criticism.

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General Outcomes	Specific Outcomes
Students will demonstrate the ability to understand and work within the culture of a group.	**Building Community** *Students will:* • interact with others in a courteous manner • accommodate the beliefs of others in work and personal environments and show respect for differences in beliefs, abilities, etiquette and styles of interaction • identify opportunities for participation in community growth.
Students will plan and make decisions with others.	**Teamwork** *Students will:* • participate effectively as group members; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • assume various roles within a group; e.g., leadership • clarify the expected outcomes of teamwork.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will orient themselves toward an occupation within a fashion textiles environment.	**Career Awareness** **Orientation** *Students will:* • identify entry-level competencies • identify post-secondary opportunities • recognize entrepreneurial opportunities within the industry • introduce themselves to local business/industry operations • match their personal interests to their job search; e.g., – identify sources of support for investigating and finding work – describe entry-level requirements – recognize potential career ladders. **Standards** *Students will:* • develop workplace protocols, procedures and standards of conduct; e.g., – demonstrate appropriate work habits – use safe and sanitary practices – demonstrate pride in themselves – demonstrate pride in their work performance – show respect for others – respect the property of others.
Students will demonstrate basic safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify safety device locations and procedures within the workplace environment • identify government regulatory bodies that support a safe workplace • demonstrate knowledge of, and the ability to access information about, Occupational Health and Safety (OHS) and the Workers' Compensation Board (WCB)

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General Outcomes	Specific Outcomes
	• demonstrate knowledge of, and adherence to, safety rules that are specific to available tools, equipment and materials • demonstrate knowledge of health hazards associated with the use of chemicals and materials and retrieve information on Material Safety Data Sheets (MSDS), using appropriate print and Internet resources • select and wear personal protective equipment (PPE) appropriate to the specific task • demonstrate knowledge of environmental issues relating to the procedures for handling hazardous waste • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements • identify potential safety hazards at work and at home; e.g. – building security – property protection – window security – fire protection.
Students will develop an increased awareness of technology to develop a high-quality product or service.	**Products and Service** **Technology Integration** *Students will:* • identify new and emerging products and technological advances used in fashion textiles. **Providing Service** *Students will:* • identify client relationships or interactions within the field of fashion textiles • identify services required or provided • collect necessary information to complete a purchase or to fill out a work order • recognize the importance of customer or client service to all businesses/industries • demonstrate professional practices and work habits • strive to meet and exceed the client's expectations.
Students will develop an understanding of sewing patterns.	**Construction** **Selecting Patterns** *Students will:* • identify related sewing terminology • locate ideas for sewing projects; e.g., catalogues, pattern envelopes

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General Outcomes	Specific Outcomes

- identify important information found on pattern envelopes; e.g.,
  - garment descriptions
  - views
  - suggested fabrics
  - required notions
  - yardage chart
  - body measurements
- select fabric and notions that suit the style and purpose of the garment.

Taking Measurements

Students will:

- identify measurement-taking procedures for both males and females
- identify figure types for both males and females
- choose pattern sizes based on measurements and figure types; e.g.,
  - fit paper patterns, using measurement comparisons
  - make alterations as necessary.

Guide Sheet

Students will:

- identify information found on a guide sheet; e.g.,
  - sketches of different styles and views
  - list of pattern pieces
  - cutting layouts
  - step-by-step instructions
- identify pattern symbols and markings found on pattern pieces; e.g.,
  - cutting lines
  - grainlines
  - place-on-fold
  - darts
  - placement lines
  - seamlines or stitching lines
  - adjustment lines
  - notches, dots, squares and triangles.

Preparing Fabric

Students will:

- identify procedures for straightening fabric ends
- identify procedures for preshrinking fabric.

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General Outcomes	Specific Outcomes
	Pattern Layout *Students will:* • identify procedures for laying out patterns; e.g., – position the pattern pieces – pin the pattern pieces to the fabric – mark the fabric – cut out the pattern. **Sewing Techniques** *Students will:* • demonstrate intermediate sewing techniques; e.g., – staystitching – darts – fasteners: zippers, buttons/buttonholes – waistbands – casings – hems. **Application** *Students will:* • demonstrate construction techniques by sewing an intermediate-level garment or costume; e.g., zippered skirt or pants, simple jacket • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.
Students will identify various trends in the field of fashion.	**Fashion Trends** **Sociology and Psychology of Clothing** *Students will:* • identify reasons for wearing clothing; e.g., modesty, protection, identification, status, adornment • identify influences on clothing choices; e.g., culture, family, peer groups, advertising • develop an understanding of fashion trends and fashion cycles. **Physiology of Clothing** *Students will:* • identify the elements of design; e.g., lines, shape, pattern, texture, colour • identify how the combination of design elements address the principles of design; e.g., balance, proportion, emphasis, rhythm, harmony/unity • identify ways to create illusions through clothing choices, using the elements and principles of design.

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General Outcomes	Specific Outcomes
	Wardrobe Planning *Students will:* • complete a wardrobe inventory; e.g., evaluate the condition and use of each item by following the four Rs (remain, revise, repair or recycle) • consider what new items to add to their wardrobe and set priorities for a wardrobe plan • revise or repair an item of clothing. **Application** *Students will:* • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.
Students will develop skills in the merchandising and marketing of clothing.	**Fashion Merchandising and Marketing** **Visual Display** *Students will:* • identify the components of an eye-appealing display; e.g., development of a theme, development of long-range plans for rotating a display • identify types of fashion displays (e.g., exterior, window, interior, showcase, remote), and describe the advantages and disadvantages of each • identify display aids; e.g., racks, mannequins, lighting, body forms, technology. **Application** *Students will:* • create a visual display, using a theme; e.g., sports, holidays, culture • evaluate the strengths or weaknesses of visual displays; e.g., self, peer or retail evaluation • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will continue to develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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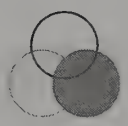

ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will demonstrate effective listening, speaking, reading and writing skills.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret occupation-related materials; e.g., – use related occupational terms – identify occupation-related literature – interpret and follow written instructions • select and create a text format to suit a purpose and audience, e.g., forms, letters, reports, memos, résumés, and: – describe uses of writing skills in related occupations – write a letter of inquiry – write a letter of thanks – complete job applications • listen and present information in a clear, concise manner; e.g., – listen attentively to organize and classify information and ideas – organize main ideas and key messages with clarity.

THINKING

Students will apply creative thinking skills to solve problems.	**Problem Solving, Decision Making and Creative Thinking** *Students will:* • apply a problem-solving model to identify the problem/issue • identify appropriate actions and develop several alternatives for each promising idea • evaluate the results, in terms of expected outcomes related to the initial problem, and evaluate personal satisfaction with the outcome of the idea; e.g., product/process.

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NUMERACY

General Outcomes	Specific Outcomes
Students will apply mathematical concepts to solve occupational problems.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion to solve problems in a meaningful context • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

INFORMATION TECHNOLOGY

Students will enhance their performance by using information technology to help complete tasks.	**Computer Operations and Computer Applications** *Students will:* • demonstrate appropriate language and etiquette when using information technology • demonstrate appropriate telephone operations; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • demonstrate basic computer operations to complete a task; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • demonstrate procedures for connecting and using audio, video and digital equipment • demonstrate procedures for sending and receiving faxes and setting up a fax machine • demonstrate procedures for copying and printing documents.

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FASHION TEXTILES 30-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will consistently demonstrate personal discovery and continuous learning. • Students will manage change effectively to support their goals. • Students will prepare themselves for entry-level employment in an occupation that reflects their personal aptitudes and interests.
Personal Management	• Students will exhibit self-esteem and confidence through the achievement of personal goals. • Students will manage risks to achieve both personal and workplace goals.
Working with Others	• Students will model effective communication skills and strategies in the home, school, community and workplace. • Students will promote equity in work and community endeavours. • Students will demonstrate the ability to complete tasks in a team environment.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will prepare for entry-level employment within a fashion textiles career environment. • Students will demonstrate entry-level standards of safe workplace practices and procedures. • Students will use technology to develop a high-quality product or service. • Students will demonstrate entry-level understanding of the construction of textile projects. • Students will develop an understanding of fashion design as an occupation or career. • Students will demonstrate the ability to design and create a garment. • Students will demonstrate an understanding of marketing in a retail setting.
Ensuring Quality	• Students will demonstrate an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will demonstrate effective listening, speaking, reading and writing skills to prepare for employment.
Thinking	• Students will research information, use creative thinking skills and use effective problem-solving strategies to solve problems.
Numeracy	• Students will demonstrate mathematical operations to effectively solve problems in a meaningful context.
Information Technology	• Students will demonstrate the effective use of information technology to perform daily workplace operations.

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EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will consistently demonstrate personal discovery and continuous learning.	**Lifelong Learning** *Students will:* • identify learning opportunities related to learning goals, commitments and resources; e.g., – identify opportunities for further education/training – locate needed financial support systems – locate needed personal support systems • practise what has been learned to build competence and confidence and evaluate the application of competencies to learning goals • create a plan that demonstrates continuous learning; e.g., – analyze requirements for graduation and for further education/training – modify a learning plan to reflect requirements and opportunities.
Students will manage change effectively to support their goals.	**Adapting to Change** *Students will:* • prioritize and assign resources to meet commitments and goals • prioritize commitments and goals to achieve a balanced lifestyle • redefine an action plan as situations change; e.g., – use adaptive strategies – redefine personal goals – select personal coping mechanisms • access available and appropriate sources of support • identify opportunities for improvement and innovation; e.g., entrepreneurship.

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General Outcomes	Specific Outcomes
Students will prepare themselves for entry-level employment in an occupation that reflects their personal aptitudes and interests.	**Career Development** *Students will:* • analyze elements of job satisfaction; e.g., recognition, environment, pay, benefits, prestige • build personal career paths and networks • analyze how work contributes to societal and economic needs and a sense of responsibility • prepare for employment through community partnership activities and organize and complete specific job tasks effectively and efficiently.

PERSONAL MANAGEMENT

Students will exhibit self-esteem and confidence through the achievement of personal goals.	**Self-development** *Students will:* • continue to create a long-term self-development plan in which they consider accomplishments and redefine self-development goals • demonstrate entry-level self-presentation appropriate to the activity and role • maintain a high standard of personal ethics when interacting with others.
Students will manage risks to achieve both personal and workplace goals.	**Risk Management** *Students will:* • maintain health and safety procedures; e.g., at home, at school, in the community and in the workplace • monitor success in reducing the impact of hazards on themselves and others • demonstrate concern for the safety of others by exhibiting appropriate behaviour in the workplace • work with others to respond to emergencies • take planned risks to contribute to personal growth.

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WORKING WITH OTHERS

General Outcomes	Specific Outcomes
Students will model effective communication skills and strategies in the home, school, community and workplace.	**Interpersonal Communication** *Students will:* • communicate thoughts and feelings appropriately; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate body language • maintain a balance between speaking, listening and responding • work together to achieve goals • demonstrate the ability to deal constructively with conflict.
Students will promote equity in work and community endeavours.	**Building Community** *Students will:* • demonstrate and model courteous behaviour in daily interactions • demonstrate respect for others and a shared understanding of diverse beliefs, etiquette and styles of interaction • assess their personal contribution to community growth.
Students will demonstrate the ability to complete tasks in a team environment.	**Teamwork** *Students will:* • assess the effectiveness of group and personal contributions; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • expand their abilities to contribute to team goals.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will prepare for entry-level employment within a fashion textiles career environment.	**Career Awareness** **Preparation** *Students will:* • assess entry-level competencies • recognize opportunities for further education/training • select post-secondary opportunities • identify local entrepreneurs • establish contacts with local businesses/industries • present marketable skills and strengths; e.g., – write a letter of application – prepare a résumé – complete application forms – identify contacts and references – collect evidence of competencies in a portfolio. **Standards** *Students will:* • demonstrate workplace protocols, procedures and standards of conduct; e.g., – demonstrate appropriate work habits – demonstrate effective human relations techniques in the workplace – practise safety in the workplace – demonstrate acceptable verbal and nonverbal communication skills – practise personal and public hygiene procedures – demonstrate entry-level competency in tools and equipment usage – use supplies correctly – follow good storage practices – demonstrate pride in their work performance – demonstrate a willingness to work – demonstrate respect for others – follow accepted principles and procedures – recognize opportunities for further education/training.

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General Outcomes	Specific Outcomes
Students will demonstrate entry-level standards of safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify and explain the use of safety devices within the workplace • demonstrate knowledge of, and the ability to access information about, Occupational Health and Safety (OHS) and the Workers' Compensation Board (WCB) • demonstrate a prework and postwork hazard assessment • demonstrate knowledge of, and adherence to, safety rules that are specific to available tools, equipment and materials • demonstrate knowledge of health hazards associated with the use of chemicals and materials and retrieve information on Material Safety Data Sheets (MSDS), using appropriate print and Internet resources • model safety consciousness by selecting and wearing personal protective equipment (PPE) appropriate to the specific task • demonstrate knowledge of environmental issues relating to the procedures for handling hazardous waste • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements.
Students will use technology to develop a high-quality product or service.	**Products and Service** **Technology Integration** *Students will:* • use new and emerging products and technological advances needed in fashion textiles; e.g., examine the effects of current technological advances in the fashion textiles industry and explain the impact of current technology on the job descriptions of future fashion textiles trade workers. **Providing Service** *Students will:* • identify client relationships or interactions within the field of fashion textiles • identify services required or provided • collect necessary information to complete a purchase or to fill out a work order • recognize the importance of customer or client service to all businesses/industries • demonstrate professional practices and work habits • strive to meet and exceed the client's expectations.

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General Outcomes	Specific Outcomes
Students will demonstrate entry-level understanding of the construction of textile projects.	**Advanced Construction** **Specialty Techniques** *Students will:* • demonstrate advanced sewing techniques; e.g., – self-finished seams: French, flat-felled, double-stitched – decorative seams: top-stitched, welted, lapped – tucks and pleats – interfacing and linings – collars – cuffs – sleeves: set-in, raglan, drop – pockets: patch, inseam. **Specialty Fabrics** *Students will:* • identify characteristics of specialty fabrics; e.g., leather, velvet, satin, crepe • demonstrate and apply skills in selecting an appropriate pattern, interfacing, threads and tools to construct a garment made from a specialty fabric. **Application** *Students will:* • complete an advanced-level garment, using specialty fabrics and/or techniques • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.
Students will develop an understanding of fashion design as an occupation or career.	**Fashion Trends and Creators** **Role of Designers** *Students will:* • describe the role of the designer in the apparel industry • identify the names and contributions of famous fashion designers • identify the steps in a garment's design process; e.g., from creation through to the marketing of the finished product • identify a designer's logos and labelling conventions. **Fashion Terminology** *Students will:* • demonstrate an understanding of key terminology; e.g., style, fashion, trend, fad, classic, craze, haute couture, prêt-à-porter, knock-offs, avante-garde.

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General Outcomes	Specific Outcomes
	Application *Students will:* • research a famous fashion designer and create a presentation, including illustrations/visual aids, that details his/her life, creations and influences • design a logo for their personal designs/company • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.
Students will demonstrate the ability to design and create a garment.	**Design and Manufacturing** **Manufacturing** *Students will:* • identify the steps in the manufacturing process; i.e., – making samples – establishing costs – taking orders – ordering materials – creating production patterns and layouts – cutting the fabric – assembling the project – inspecting the final work – distributing the product. **Illustration** *Students will:* • create a design sketch of a perfectly proportioned figure, using standards developed by the fashion industry; e.g., 8-head, 9-head, 10-head • create a croquis or stylized drawing of a figure, using standards developed by the fashion industry; e.g., left-twist, right-twist. **Pattern Making** *Students will:* • demonstrate drawing and measuring skills when creating a basic garment pattern, using their choice of tools; e.g., skirt, shorts, pants. **Application** *Students will:* • complete a final illustration of their choice • construct a garment from a pattern they have made • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.

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General Outcomes	Specific Outcomes
Students will demonstrate an understanding of marketing in a retail setting.	**Fashion Merchandising and Marketing** **Retail** *Students will:* • define retail • identify various retail operations; e.g., – retail stores – direct retailers – factory outlets – online sales – cottage industries • identify the types of jobs available within the retail industry; e.g., retail sales, buyers, merchandise manager.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will demonstrate an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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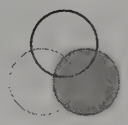

ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will demonstrate effective listening, speaking, reading and writing skills to prepare for employment.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret occupation-related materials for a specific purpose; e.g., – read related health and safety documents – read terms of employment documents – follow written instructions specific to an occupational area • create text for a specific purpose that clearly communicates information; e.g., – write a résumé – write a job description – submit job application forms • communicate thoughts and ideas and listen to the thoughts and ideas of others to effectively complete a task; e.g., – follow oral instructions – give effective oral instructions when necessary.

THINKING

Students will research information, use creative thinking skills and use effective problem-solving strategies to solve problems.	**Problem Solving, Decision Making, Finding Information and Creative Thinking** *Students will:* • demonstrate an effective problem-solving model; e.g., – identify the need for a solution to a problem/issue – identify why information is needed; e.g., make decisions, inform, persuade • identify appropriate actions and select and apply information that meets their purposes and needs • evaluate the results in terms of expected outcomes and assess the impact of information on their purpose and audience.

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NUMERACY

General Outcomes	Specific Outcomes
Students will demonstrate mathematical operations to effectively solve problems in a meaningful context.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

INFORMATION TECHNOLOGY

Students will demonstrate the effective use of information technology to perform daily workplace operations.	**Computer Operations and Computer Applications** *Students will:* • model and assume personal responsibility for the ethical use of information technologies • demonstrate appropriate telephone operations within the workplace; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • use computer operations to assist in the completion of daily workplace operations; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • demonstrate procedures for connecting and using audio, video and digital equipment • demonstrate procedures for sending and receiving faxes and setting up a fax machine • demonstrate procedures for copying and printing documents.

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INDUSTRIAL TEXTILES 20-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will apply their abilities and interests toward achieving learning goals. • Students will practise the skills and abilities needed to manage change. • Students will orient themselves toward an occupation that reflects their personal aptitudes and interests.
Personal Management	• Students will increase their self-esteem and confidence and enhance their ability to set personal goals and priorities. • Students will understand risks and be accountable for their actions.
Working with Others	• Students will practise effective communication skills and strategies in an occupational context. • Students will demonstrate the ability to understand and work within the culture of a group. • Students will plan and make decisions with others.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will orient themselves toward an occupation within an industrial textiles career environment. • Students will demonstrate basic safe workplace practices and procedures. • Students will develop an increased awareness of technology to develop a high-quality product or service. • Students will develop an understanding of various fabric services. • Students will develop an understanding of interior design and home decor textile projects.
Ensuring Quality	• Students will continue to develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will demonstrate effective listening, speaking, reading and writing skills.
Thinking	• Students will apply creative thinking skills to solve problems.
Numeracy	• Students will apply mathematical concepts to solve occupational problems.
Information Technology	• Students will enhance their performance by using information technology to help complete tasks.

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EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will apply their abilities and interests toward achieving learning goals.	**Lifelong Learning** *Students will:* • relate learning preferences and strengths to formal and informal learning opportunities and identify post-secondary opportunities within the related field • assess learning goals and current competencies, identify competencies needing development and identify and prioritize learning goals • create a pathway of senior high school courses to reflect learning goals • identify educational possibilities; e.g., Registered Apprenticeship Program (RAP), Green Certificate, Career and Technology Studies (CTS) and Career Internship.
Students will practise the skills and abilities needed to manage change.	**Adapting to Change** *Students will:* • identify goals, responsibilities and commitments • assess and reflect on the success of an action plan; e.g., – create alternative choices to deal with unexpected change – identify stressors in personal environments that they can and cannot change • identify the need for personal support and create an inventory of available personal and community sources of support.
Students will orient themselves toward an occupation that reflects their personal aptitudes and interests.	**Career Development** *Students will:* • assess work preferences and nonpreferences (e.g., indoor, outdoor, shift work), assess life/work options and outline career goals and paths • work in and seek out a variety of roles and responsibilities • measure and celebrate personal contributions to workplace goals; e.g., paid, unpaid or volunteer work • orient themselves to the workplace through community partnerships and assess personal performance in terms of workplace expectations.

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PERSONAL MANAGEMENT

General Outcomes	Specific Outcomes
Students will increase their self-esteem and confidence and enhance their ability to set personal goals and priorities.	**Self-development** *Students will:* • re-evaluate an action plan to develop strengths and talents • use strengths and talents to achieve personal goals • clarify acceptable and appropriate behaviours for specific activities and roles • act ethically in personal, community and workplace contexts and accept the consequences of their actions.
Students will understand risks and be accountable for their actions.	**Risk Management** *Students will:* • follow health and safety procedures; e.g., at home, at school, in the community and in the workplace • identify potential hazards, take corrective action and develop and practise action plans to ensure safety • practise personal emergency responses • assess their comfort level with, and the consequences of, taking risks.

WORKING WITH OTHERS

Students will practise effective communication skills and strategies in an occupational context.	**Interpersonal Communication** *Students will:* • assess the effectiveness of communication strategies used to communicate thoughts and feelings; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate body language • assess verbal and nonverbal communication strategies • apply social norms to build specific relationships • demonstrate the ability to accept praise and/or criticism.
Students will demonstrate the ability to understand and work within the culture of a group.	**Building Community** *Students will:* • interact with others in a courteous manner • accommodate the beliefs of others in work and personal environments and show respect for differences in beliefs, abilities, etiquette and styles of interaction • identify opportunities for participation in community growth.

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General Outcomes	Specific Outcomes
Students will plan and make decisions with others.	**Teamwork** *Students will:* • participate effectively as group members; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • assume various roles within a group; e.g., leadership • clarify the expected outcomes of teamwork.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will orient themselves toward an occupation within an industrial textiles career environment.	**Career Awareness** **Orientation** *Students will:* • identify entry-level competencies • identify post-secondary opportunities • recognize entrepreneurial opportunities within the industry • introduce themselves to local business/industry operations • match their personal interests to their job search; e.g., – identify sources of support for investigating and finding work – describe entry-level requirements – recognize potential career ladders. **Standards** *Students will:* • develop workplace protocols, procedures and standards of conduct; e.g., – demonstrate appropriate work habits – use safe and sanitary practices – demonstrate pride in themselves – demonstrate pride in their work performance – show respect for others – respect the property of others.
Students will demonstrate basic safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify safety device locations and procedures within the workplace environment • demonstrate knowledge of, and the ability to access information about, Occupational Health and Safety (OHS) and the Workers' Compensation Board (WCB) • demonstrate knowledge of, and adherence to, safety rules that are specific to available tools, equipment and materials

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General Outcomes	Specific Outcomes
	• demonstrate knowledge of health hazards associated with the use of chemicals and materials and retrieve information on Material Safety Data Sheets (MSDS), using appropriate print and Internet resources • select and wear personal protective equipment (PPE) appropriate to the specific task • demonstrate knowledge of environmental issues relating to the procedures for handling hazardous waste • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements.
Students will develop an increased awareness of technology to develop a high-quality product or service.	**Products and Service** **Technology Integration** *Students will:* • identify new and emerging products and technological advances used in industrial textiles. **Providing Service** *Students will:* • identify client relationships or interactions within the field of industrial textiles • identify services required or provided • collect necessary information to complete a purchase or to fill out a work order • recognize the importance of customer or client service to all businesses/industries • demonstrate professional practices and work habits • strive to meet and exceed the client's expectations.
Students will develop an understanding of various fabric services.	**Fabric Services** **Dry Cleaning, Steam Cleaning and Laundering** *Students will:* • identify the main steps in the fabric-care process; e.g., cleaning (wet/dry), repairing, restoring • identify the operation of a cleaning plant • identify equipment uses and cleaning procedures • identify different types of stains • demonstrate spot-removal techniques • demonstrate the removal of identified stains

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General Outcomes	Specific Outcomes
	• identify safety related issues; e.g., use of chemicals • describe the process for dry cleaning fabrics • identify types of cleaning solvents; e.g., petroleum, synthetic • identify safety regulations related to the use of steam cleaners • use a steam cleaner correctly • identify and tag garments; e.g., dry cleaning, shirt laundry • identify procedures for receiving and distributing garments to customers • demonstrate the ability to write invoices, handle cash/credit transactions and assemble orders for delivery • identify specialty equipment. **Alterations and Repairs** *Students will:* • identify the basic tools required for repairs and alterations • demonstrate basic sewing preparation techniques; e.g., measuring, marking, pinning/basting • demonstrate basic hand-sewing techniques • demonstrate basic sewing-machine techniques; e.g., – sew straight lines – follow a guide – baste seams – sew seams – attach zippers to fabric – sew zigzag stitches – sew cuffs, tapers, pants • demonstrate a basic ability to repair zippers, sew on arm patches and replace buttons • demonstrate an understanding of a variety of fabrics and their uses when making repairs and alterations • minimize waste when using materials to complete a project or task • select appropriate fabric and thread when making repairs and alterations • take accurate measurements to alter fabrics • identify various repair techniques for different fabrics and items of clothing; e.g. shirts, pants, jeans • recognize the principle of recycling fabric • demonstrate a variety of ways to recycle fabric; e.g., piecing fabrics, using special fabrics.

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General Outcomes	Specific Outcomes
	Application *Students will:* • develop a plan of action to alter or repair garments • apply a variety of alteration and/or design procedures when repairing, altering and recycling projects; e.g., – redesign: change collars or necklines; add, replace or remove details; add new pockets to shorts or pants – restyle: convert a sweater to a vest, pants to a skirt, blankets to vests or skirts – create a new garment: shirt and skirt from a dress, vest from a skirt – other: add appliqués to cover worn fabric areas; add embroidery, fringe, studs, new buttons • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.
Students will develop an understanding of interior design and home decor projects.	**Interior Design and Home Decor** **Physiology of Interior Design** *Students will:* • identify the elements of design in relation to interior design; e.g., line, shape, pattern, texture, colour • identify the principles of design in relation to planning an interior design; e.g., balance, proportion, emphasis, rhythm, harmony/unity • identify ways to create illusions in interior spaces, using the elements and principles of design • identify the rules that guide furniture choice and placement. **Drawing Skills** *Students will:* • create a design sketch, using 2-D methods, by hand and/or by using CAD drawing tools; e.g., floor plan to scale, elevations to scale • create a design sketch, using 3-D methods, by hand and/or by using CAD drawing tools; e.g., 1-point perspective • create a scale model or storyboard of a planned interior space, complete with paint colours, floor coverings, window treatments, furniture and accessories.

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General Outcomes	Specific Outcomes
	Application *Students will:* • design and construct a home décor project to demonstrate their knowledge of interior design and home décor; e.g., duvet cover, drapery treatment, accent treatment • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.

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General Outcomes	Specific Outcomes
Students will continue to develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will demonstrate effective listening, speaking, reading and writing skills.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret occupation-related materials; e.g., – use related occupational terms – identify occupation-related literature – interpret and follow written instructions • select and create a text format to suit a purpose and audience, e.g., forms, letters, reports, memos, résumés, and: – describe uses of writing skills in related occupations – write a letter of inquiry – write a letter of thanks – complete job applications • listen and present information in a clear, concise manner; e.g., – listen attentively to organize and classify information and ideas – organize main ideas and key messages with clarity.

THINKING

Students will apply creative thinking skills to solve problems.	**Problem Solving, Decision Making and Creative Thinking** *Students will:* • apply a problem-solving model to identify the problem/issue • identify appropriate actions and develop several alternatives for each promising idea • evaluate the results, in terms of expected outcomes related to the initial problem, and evaluate personal satisfaction with the outcome of the idea; e.g., product/process.

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NUMERACY

General Outcomes	Specific Outcomes
Students will apply mathematical concepts to solve occupational problems.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion to solve problems in a meaningful context • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

INFORMATION TECHNOLOGY

Students will enhance their performance by using information technology to help complete tasks.	**Computer Operations and Computer Applications**
	
	Students will:
	• demonstrate appropriate language and etiquette when using information technology
	• demonstrate appropriate telephone operations; e.g., answer telephone calls appropriately, locate numbers and make telephone calls
	• demonstrate basic computer operations to complete a task; e.g.,
	  – use basic keyboarding skills
	  – store, organize and retrieve information correctly
	  – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet
	  – access, send and retrieve e-mail and attachments
	• demonstrate procedures for connecting and using audio, video and digital equipment
	• demonstrate procedures for sending and receiving faxes and setting up a fax machine
	• demonstrate procedures for copying and printing documents.

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INDUSTRIAL TEXTILES 30-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will consistently demonstrate personal discovery and continuous learning. • Students will manage change effectively to support their goals. • Students will prepare themselves for entry-level employment in an occupation that reflects their personal aptitudes and interests.
Personal Management	• Students will exhibit self-esteem and confidence through the achievement of personal goals. • Students will manage risks to achieve both personal and workplace goals.
Working with Others	• Students will model effective communication skills and strategies in the home, school, community and workplace. • Students will promote equity in work and community endeavours. • Students will demonstrate the ability to complete tasks in a team environment.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will prepare for entry-level employment within an industrial textiles career environment. • Students will demonstrate entry-level standards of safe workplace practices and procedures. • Students will use technology to develop a high-quality product or service. • Students will identify and demonstrate the safe use of hand and power tools, equipment and materials. • Students will develop the knowledge and skills to use tools and equipment safely and properly while working on a small-frame upholstery project. • Students will develop knowledge of advanced upholstering techniques while working on a coil-spring upholstery project. • Students will demonstrate an understanding of marketing in a retail setting.
Ensuring Quality	• Students will demonstrate an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will demonstrate effective listening, speaking, reading and writing skills to prepare for employment.
Thinking	• Students will research information, use creative thinking skills and use effective problem-solving strategies to solve problems.
Numeracy	• Students will demonstrate mathematical operations to effectively solve problems in a meaningful context.
Information Technology	• Students will demonstrate the effective use of information technology to perform daily workplace operations.

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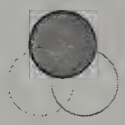

EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will consistently demonstrate personal discovery and continuous learning.	**Lifelong Learning** *Students will:* • identify learning opportunities related to learning goals, commitments and resources; e.g., – identify opportunities for further education/training – locate needed financial support systems – locate needed personal support systems • practise what has been learned to build competence and confidence and evaluate the application of competencies to learning goals • create a plan that demonstrates continuous learning; e.g., – analyze requirements for graduation and for further education/training – modify a learning plan to reflect requirements and opportunities.
Students will manage change effectively to support their goals.	**Adapting to Change** *Students will:* • prioritize and assign resources to meet commitments and goals • prioritize commitments and goals to achieve a balanced lifestyle • redefine an action plan as situations change; e.g., – use adaptive strategies – redefine personal goals – select personal coping mechanisms • access available and appropriate sources of support • identify opportunities for improvement and innovation; e.g., entrepreneurship.
Students will prepare themselves for entry-level employment in an occupation that reflects their personal aptitudes and interests.	**Career Development** *Students will:* • analyze elements of job satisfaction; e.g., recognition, environment, pay, benefits, prestige • build personal career paths and networks • analyze how work contributes to societal and economic needs and a sense of responsibility • prepare for employment through community partnership activities and organize and complete specific job tasks effectively and efficiently.

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PERSONAL MANAGEMENT

General Outcomes	Specific Outcomes
Students will exhibit self-esteem and confidence through the achievement of personal goals.	**Self-development** *Students will:* • continue to create a long-term self-development plan in which they consider accomplishments and redefine self-development goals • demonstrate entry-level self-presentation appropriate to the activity and role • maintain a high standard of personal ethics when interacting with others.
Students will manage risks to achieve both personal and workplace goals.	**Risk Management** *Students will:* • maintain health and safety procedures; e.g., at home, at school, in the community and in the workplace • monitor success in reducing the impact of hazards on themselves and others • demonstrate concern for the safety of others by exhibiting appropriate behaviour in the workplace • work with others to respond to emergencies • take planned risks to contribute to personal growth.

WORKING WITH OTHERS

Students will model effective communication skills and strategies in the home, school, community and workplace.	**Interpersonal Communication** *Students will:* • communicate thoughts and feelings appropriately; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate body language • maintain a balance between speaking, listening and responding • work together to achieve goals • demonstrate the ability to deal constructively with conflict.
Students will promote equity in work and community endeavours.	**Building Community** *Students will:* • demonstrate and model courteous behaviour in daily interactions • demonstrate respect for others and a shared understanding of diverse beliefs, etiquette and styles of interaction • assess their personal contribution to community growth.

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General Outcomes	Specific Outcomes
Students will demonstrate the ability to complete tasks in a team environment.	**Teamwork** *Students will:* • assess the effectiveness of group and personal contributions; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • expand their abilities to contribute to team goals.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will prepare for entry-level employment within an industrial textiles career environment.	**Career Awareness** **Preparation** *Students will:* • assess entry-level competencies • recognize opportunities for further education/training • select post-secondary opportunities • identify local entrepreneurs • establish contacts with local businesses/industries • present marketable skills and strengths; e.g., – write a letter of application – prepare a résumé – complete application forms – identify contacts and references – collect evidence of competencies in a portfolio. **Standards** • demonstrate workplace protocols, procedures and standards of conduct; e.g., – demonstrate appropriate work habits – demonstrate effective human relations techniques in the workplace – practise safety in the workplace – demonstrate acceptable verbal and nonverbal communication skills – practise personal and public hygiene procedures – demonstrate entry-level competency in tools and equipment usage – use supplies correctly – follow good storage practices – demonstrate pride in their work performance – demonstrate a willingness to work – demonstrate respect for others – follow accepted principles and procedures – recognize opportunities for further education/training.

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General Outcomes	Specific Outcomes
Students will demonstrate entry-level standards of safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify and explain the use of safety devices within the workplace • demonstrate knowledge of, and the ability to access information about, Occupational Health and Safety (OHS) and the Workers' Compensation Board (WCB) • demonstrate a prework and postwork hazard assessment • demonstrate knowledge of, and adherence to, safety rules that are specific to available tools, equipment and materials • demonstrate knowledge of health hazards associated with the use of chemicals and materials and retrieve information on Material Safety Data Sheets (MSDS), using appropriate print and Internet resources • model safety consciousness by selecting and wearing personal protective equipment (PPE) appropriate to the specific task • demonstrate knowledge of environmental issues relating to the procedures for handling hazardous waste • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements.
Students will use technology to develop a high-quality product or service.	**Products and Service** **Technology Integration** *Students will:* • use new and emerging products and technological advances needed in industrial textiles; e.g., examine the effects of current technological advances in the industrial textiles industry and explain the impact of current technology on the job descriptions of future industrial textiles trade workers. **Providing Service** *Students will:* • identify client relationships or interactions within the field of industrial textiles • identify services required or provided • collect necessary information to complete a purchase or to fill out a work order • recognize the importance of customer or client service to all businesses/industries • demonstrate professional practices and work habits • strive to meet and exceed the client's expectations.

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General Outcomes	Specific Outcomes
Students will identify and demonstrate the safe use of hand and power tools, equipment and materials.	**Tools and Equipment** **Tools of the Trade** *Students will:* • identify and demonstrate the safe use of hand tools; e.g., – cutting: upholsterer's shears – measuring: measuring tape, metal ruler – tacking: hammers, mallets, pliers – connecting: button tufter, webbing stretcher – sewing: needles, pins • identify and demonstrate the safe use of power tools; e.g., – air stapler/tacker – air glue gun – foam cutter – industrial sewing machine • identify and demonstrate the safe use of materials; e.g., – tacks – staples – edge roll – webbing, burlap, cambric – springs – padding. **Fabrics** *Students will:* • identify the properties of fabrics suitable for an upholstery project; e.g., – fibre content, weave, weight, hand – fabric width, railroading – nap, pattern, design, colour – cost. **Application** *Students will:* • use an estimate chart to determine the amount of fabric required to cover various furniture pieces, based on the fabrics' properties • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.

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General Outcomes	Specific Outcomes
Students will develop the knowledge and skills to use tools and equipment safely and properly while working on a small-frame upholstery project.	**The Upholstery Process** **Construction** *Students will:* • determine appropriate fabrics, and quantities required, for specific jobs • remove staples, tacks, padding and fabric from a frame, using the appropriate tools and equipment • use the fabric removed from the frame as a pattern • lay out the pattern: – considering the fabric width and nap – matching plaids, stripes and motifs – practising fabric conservation • cut out the pattern, using upholstery shears • mark the fabric for buttons, corners, pleats and tucks, using tailor's chalk or soap • determine the types of padding required and attach them to the frame; e.g., fibre mat, foam, cotton felt • use the fabric to cover a small frame • use appropriate tacking and stapling equipment • apply any connectors; e.g., buttons • apply cambric fabric on the underside of a small frame. **Application** • demonstrate their knowledge of the upholstery process by designing and constructing a small-frame project; e.g., ottoman, padded box • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.
Students will develop knowledge of advanced upholstering techniques while working on a coil-spring upholstery project.	**Advanced Techniques** *Students will:* • install webbing, using a webbing stretcher • tie springs, using upholstery knots; e.g., clove, simple, overhand, clove spring • attach an edge roll; e.g., apply simple welting, as required. **Application** *Students will:* • demonstrate their knowledge of advanced upholstering techniques by designing and constructing a coil-spring project; e.g., stool • insert into a portfolio any relevant documentation of completed projects/assignments; e.g., photographs, certificates, patterns.

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General Outcomes	Specific Outcomes
Students will demonstrate an understanding of marketing in a retail setting.	**Furniture Merchandising and Marketing** **Retail** *Students will:* • define retail • identify various retail operations; e.g., – retail stores – direct retailers – factory outlets – online sales – cottage industries • identify the types of jobs available within the retail industry; e.g., retail sales, buyers, merchandise manager.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will demonstrate an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will demonstrate effective listening, speaking, reading and writing skills to prepare for employment.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret occupation-related materials for a specific purpose; e.g., – read related health and safety documents – read terms of employment documents – follow written instructions specific to an occupational area • create text for a specific purpose that clearly communicates information; e.g., – write a résumé – write a job description – submit job application forms • communicate thoughts and ideas and listen to the thoughts and ideas of others to effectively complete a task; e.g., – follow oral instructions – give effective oral instructions when necessary.

THINKING

Students will research information, use creative thinking skills and use effective problem-solving strategies to solve problems.	**Problem Solving, Decision Making, Finding Information and Creative Thinking** *Students will:* • demonstrate an effective problem-solving model; e.g., – identify the need for a solution to a problem/issue – identify why information is needed; e.g., make decisions, inform, persuade • identify appropriate actions and select and apply information that meets their purposes and needs • evaluate the results in terms of expected outcomes and assess the impact of information on their purpose and audience.

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NUMERACY

General Outcomes	Specific Outcomes
Students will demonstrate mathematical operations to effectively solve problems in a meaningful context.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

INFORMATION TECHNOLOGY

Students will demonstrate the effective use of information technology to perform daily workplace operations.	**Computer Operations and Computer Applications** *Students will:* • model and assume personal responsibility for the ethical use of information technologies • demonstrate appropriate telephone operations within the workplace; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • use computer operations to assist in the completion of daily workplace operations; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • demonstrate procedures for connecting and using audio, video and digital equipment • demonstrate procedures for sending and receiving faxes and setting up a fax machine • demonstrate procedures for copying and printing documents.

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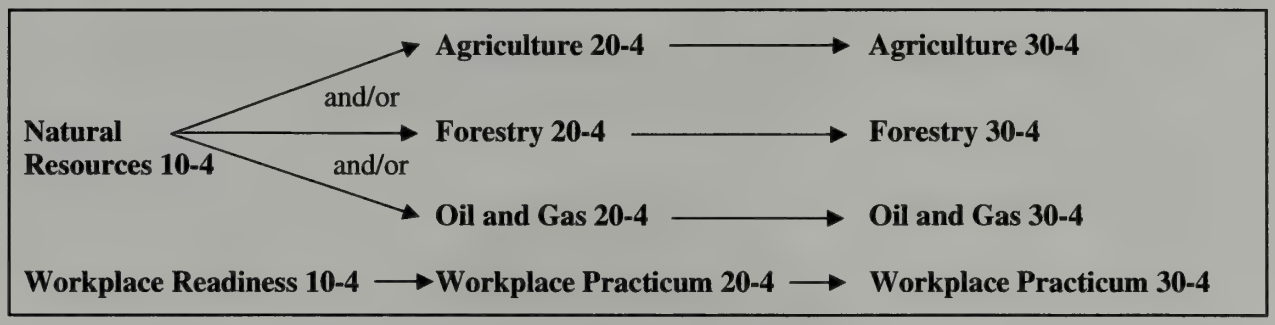
KNOWLEDGE AND EMPLOYABILITY
NATURAL RESOURCES

COURSE SEQUENCE



Knowledge and Employability 10-level courses provide opportunities for *exploration* of, and *orientation* toward, an occupational grouping in a single career field. In 20-level courses, students progress from *orientation* toward *preparation*, and in 30-level courses students are involved in *preparation* for direct job entry.

Natural Resources courses are designed to teach occupational knowledge and skills for entry-level positions in agriculture, forestry and natural gas by developing employability competencies that relate to all career paths.

- All courses focus on developing career awareness, safety standards and knowledge of tools, equipment and materials related to the industry.
- Natural Resources 10-4 provides a basis for, and an introduction to, Agriculture 20-4, Forestry 20-4 and Oil and Gas 20-4. Natural Resources 10-4 focuses on harvesting and processing practices for each industry addressed in the strand.
- Agriculture 20-4 and 30-4 focus on practical experience with land and crop development and livestock care and feeding.
- Students interested in agriculture should be encouraged to take courses in the horticulture stream or transition to the Green Certificate Program.
- Forestry 20-4 and 30-4 focus on mapping, harvesting and processing equipment and practices; forest fire management; environmentalism and field preparation.
- Oil and Gas 20-4 and 30-4 focus on processing equipment and practices, energy source identification, resource management and field preparation.
- A related Workplace Practicum or Work Experience course is recommended to further enhance employability and occupational skills and to adequately prepare students for entry into the work force. In senior high school, a 30-level Workplace Practicum course, 30-level Work Experience course or 30-level Green Certificate course is required to fulfill the requirements of a Certificate of High School Achievement. Workplace practicums are supportive work placements in a related field that will allow students to validate their learning in the workplace.

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COURSE DELIVERY

This Knowledge and Employability occupational strand includes three sequences of 5-credit courses. Students progress through the courses in a sequence and may combine courses across sequences to increase the depth of their knowledge.

The 10-level course is a prerequisite for any of the 20-level courses in the strand. The 20-level course in each sequence is a prerequisite for the 30-level course in that sequence.

The occupational courses may be offered in a variety of learning environments that range from a classroom in a school to a business/industry work site. The courses offer a balance between school-based and work-based learning that provides options for students to enter the workplace or to pursue post-secondary education or training.

GOALS

Students in Knowledge and Employability occupational courses will:

- identify standards determined by the workplace for the academic and occupational competencies considered necessary for success
- demonstrate practical applications through on- and off-campus experiences/community partnerships
- experience career development to assist them in exploring careers, assessing their career skills and developing a career-focused portfolio
- develop interpersonal skills to ensure respect, support and cooperation with others
- develop safety awareness and habits to ensure a safe working environment.

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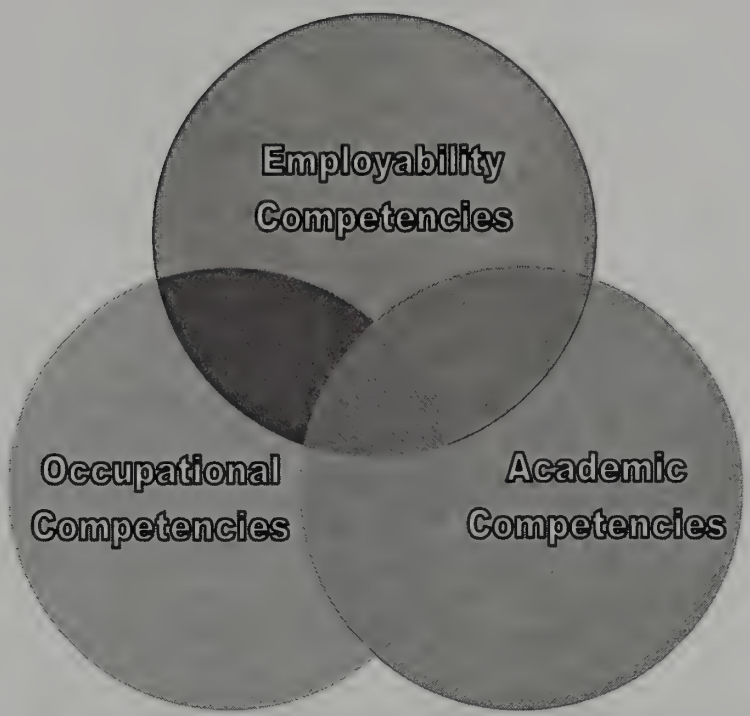
COMPETENCIES FRAMEWORK

Each Knowledge and Employability occupational course is made up of three elements: employability, occupational and academic competencies. The combination of these three elements is essential to the delivery of the occupational courses.

- Employability competencies are transferable to all occupations and are consistent throughout all courses.
- Occupational competencies are specific to an occupational area and provide the context through which students will develop their employability competencies.
- Academic competencies are to be reinforced and further developed through the occupational context that provides relevance to the academic courses.

The integration of the three elements is essential to equip students to make the transition from school to the workplace.

KNOWLEDGE AND EMPLOYABILITY OCCUPATIONAL COURSES
COMPETENCIES FRAMEWORK



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NATURAL RESOURCES 10-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will develop an awareness of how learning contributes to personal success. • Students will develop an ability to manage change effectively. • Students will explore and discover personal aptitudes and interests related to occupational opportunities.
Personal Management	• Students will develop self-esteem, confidence and the ability to set personal goals and priorities. • Students will identify and understand the risks associated with occupational activities.
Working with Others	• Students will develop communication skills and strategies in an occupational context. • Students will demonstrate respect for the thoughts and opinions of others in the group. • Students will demonstrate positive effort and behaviour toward achieving a group's goals.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will explore a variety of occupations within a natural resources career environment. • Students will develop basic safe workplace practices and procedures. • Students will develop a basic understanding of natural resources products and services. • Students will identify basic mapping skills and identify land allocation for each industry. • Students will identify processes for growing and locating resources. • Students will identify methods for harvesting agriculture, forestry and oil and gas products.
Ensuring Quality	• Students will develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will enhance their ability to listen, speak, read and write effectively.
Thinking	• Students will develop problem-solving strategies.
Numeracy	• Students will understand the value of numeracy skills in the workplace.
Information Technology	• Students will familiarize themselves with the information technology used in daily workplace operation.

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EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will develop an awareness of how learning contributes to personal success.	**Lifelong Learning** *Students will:* • identify learning preferences and strengths and apply learning styles and strategies appropriate to the situation • set learning goals and identify how formal/informal learning can help them achieve goals • develop an awareness of senior high school courses and work experience and identify educational possibilities; e.g., Registered Apprenticeship Program (RAP), Green Certificate, Career and Technology Studies (CTS) and Career Internship.
Students will develop an ability to manage change effectively.	**Adapting to Change** *Students will:* • identify available support resources and assess potential barriers • prepare an action plan to proactively respond to a particular change or challenge.
Students will explore and discover personal aptitudes and interests related to occupational opportunities.	**Career Development** *Students will:* • create an inventory of personal competencies, interests, goals and work preferences and link this inventory to career options • identify sources of support for investigating and finding work; e.g., Alberta Learning Information Service (ALIS) Web site (http://www.alis.gov.ab.ca) • describe how work contributes to individual goals • explore the workplace through community partnerships and identify employer and employee expectations, rights and responsibilities.

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PERSONAL MANAGEMENT

General Outcomes	Specific Outcomes
Students will develop self-esteem, confidence and the ability to set personal goals and priorities.	**Self-development** *Students will:* • identify personal characteristics, strengths and talents and establish an action plan to build on them • recognize the use of strengths and talents to achieve goals • identify acceptable and appropriate behaviours and present themselves to suit an activity or role; e.g., body language, grooming, clothing, manners • describe personal beliefs about what is right and wrong and assess the consequences of ethical/unethical behaviours.
Students will identify and understand the risks associated with occupational activities.	**Risk Management** *Students will:* • identify current health and safety procedures; e.g., at home, at school, in the community and in the workplace • identify risks that could impact themselves and others and identify hazards in the work environment; e.g., chemical, physical, biological and ergonomic • identify a potential emergency situation and develop strategies for personal emergency responses • identify sources of support when taking risks in their personal lives and in the workplace; e.g., entrepreneurship.

WORKING WITH OTHERS

Students will develop communication skills and strategies in an occupational context.	**Interpersonal Communication** *Students will:* • demonstrate appropriate communication strategies for communicating thoughts and feelings; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate language and body language • develop awareness of verbal and nonverbal communication strategies • improve their ability to communicate by working with others • communicate common goals and expectations to improve their team's ability to achieve goals • identify causes of conflict.

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General Outcomes	Specific Outcomes
Students will demonstrate respect for the thoughts and opinions of others in the group.	**Building Community** *Students will:* • identify commonly accepted courteous behaviour • assess and respect how their personal values and beliefs differ from those of others and how those beliefs impact personal behaviour • identify the value of volunteering in community activities; e.g., charity work, community car wash.
Students will demonstrate positive effort and behaviour toward achieving a group's goals.	**Teamwork** *Students will:* • identify team goals • work independently and with others to support team goals; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • establish short- and long-term team goals.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will explore a variety of occupations within a natural resources career environment.	**Career Awareness** **Exploration** *Students will:* • identify employment opportunities within a career field; e.g., identify local harvesting and processing operations • define and recognize entrepreneurship as a potential career path • research employment information; e.g., duties, working conditions, personal characteristics, education, salary. **Standards** *Students will:* • identify workplace protocols, procedures and standards of conduct; e.g., – clean the entire work area, return tools to designated areas, minimize the waste of materials – identify related health and sanitation standards – display punctuality and come prepared for classroom and laboratory activities – treat the laboratory area with care and with attention to potential workplace health and safety risks – treat other members of the team with respect – use appropriate language and terminology – wear appropriate dress.
Students will develop basic safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify and demonstrate preventive measures to avoid accidents and injury to themselves and others; e.g., – identify safety device locations in the laboratory or classroom; e.g., eyewash station, emergency shut-off, fire extinguisher, emergency exits, telephone – demonstrate the correct procedures for addressing injuries

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General Outcomes	Specific Outcomes
	– identify the proper use of tools with regard to other classmates and laboratory conditions – identify personal protective equipment (PPE); e.g., coveralls, proper eyewear, proper footwear – demonstrate proper body position while at a work station – maintain a safe and clean work area – identify and practise the safe use of electrical equipment • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements.
Students will develop a basic understanding of natural resources products and services.	**Products and Services** *Students will:* • identify natural resources industries in Canada • recognize how natural resources are used to create products • define producers, consumers and products • identify producers, consumers and products in the agriculture, forestry and oil and gas industries • identify the steps used to distribute harvested products to consumers • identify major determinants of production; e.g., – climate – soil and water – supply and demand – available equipment – labour – transportation.
Students will identify basic mapping skills and identify land allocation for each industry.	**Mapping/Land Allocation** **Mapping** *Students will:* • identify basic mapping skills; e.g., – compass rose, intermediate and cardinal directions – grid patterns – latitude/longitude – symbols and legends – scales/distance – landmarks – reading a road map – plotting a route

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General Outcomes	Specific Outcomes
	• identify types of maps; e.g., – topographical or contour – base – soil type – geological – forest stands or types – road • identify topographical mapping processes; e.g., elevations and depressions. **Compass** *Students will:* • identify the basic functions of a compass • use a compass and a map together to locate destinations • demonstrate orienteering skills. **Land Allocation** *Students will:* • recognize that land is a natural resource; e.g., ownership, utilization • identify the basic origins of soil; e.g., topsoil, subsoil and parent material • recognize the causes of soil erosion; e.g., water, wind • identify resource allocation per section of land • identify land classification terminology; e.g., acre, quarter and a half • compare the current variety and value of Alberta's land resources; e.g., – recreation and aesthetics – wildlife habitat – fibre production – range lands – coal and petroleum projects – hunting and trapping – water, air and soil quality – ecosystem maintenance – job creation.

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General Outcomes	Specific Outcomes
Students will identify processes for growing and locating resources.	**Growing and Locating Resources** *Students will:* • identify resource locations in Alberta • identify licensing or other requirements when establishing land allocation • identify government controls over natural resources and products • identify various sources of energy and where they are found; e.g., – renewable; e.g., sun/solar, wind, water, earth/geothermal – nonrenewable; e.g., minerals, oil and gas • identify useable land for each resource; e.g., livestock and crops, trees, oil and gas • identify possible yields for various resources • identify planting and seeding processes for agricultural and forestry crop production • identify locating procedures; e.g., – satellite imagery – aerial photographs – land surveys – geological surveys – seismic exploration • identify environmental factors related to land allocation for resource extraction or harvesting; e.g., – land-use practices – soil and water quality – wildlife habitat – recreation and natural areas.
Students will identify methods for harvesting agriculture, forestry and oil and gas products.	**Harvesting** **Agriculture, Forestry and Oil and Gas** *Students will:* • identify the tools and equipment used for different harvesting methods • determine when and how much to harvest per resource, within the parameters of a sustainable yield • identify how technology has resulted in changes in the harvesting of natural resources • identify harvesting methods for: – agricultural resources; e.g., butchering livestock, swathers and combines, forage harvesting – forestry resources; e.g., clearcutting, selective cutting, shelter wood cutting – oil and gas resources; e.g., drilling, cracking and fractionating, chemical processes.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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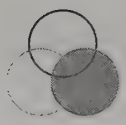

ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will enhance their ability to listen, speak, read and write effectively.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret information presented in a variety of forms, including texts, videos, graphs, charts, diagrams, manuals • identify a purpose for writing • print or write legibly, spell accurately and apply rules of grammar to construct texts • listen and ask questions to expand information and to appreciate the points of view of others.

THINKING

Students will develop problem-solving strategies.	**Problem Solving** *Students will:* • identify and define, and ask relevant questions to clarify, the problem • evaluate the results in terms of expected outcomes.

NUMERACY

Students will understand the value of numeracy skills in the workplace.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion to solve problems in a meaningful context • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

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INFORMATION TECHNOLOGY

General Outcomes	Specific Outcomes
Students will familiarize themselves with the information technology used in daily workplace operation.	**Computer Operations** *Students will:* • identify the most appropriate technology tool for the task; e.g., fax, e-mail, networks, telephone • identify appropriate telephone operations; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • identify basic computer operations; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • identify procedures for connecting and using audio, video and digital equipment • identify procedures for sending and receiving faxes and setting up a fax machine • identify procedures for copying and printing documents.

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AGRICULTURE 20-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will apply their abilities and interests toward achieving learning goals. • Students will practise the skills and abilities needed to manage change. • Students will orient themselves toward an occupation that reflects their personal aptitudes and interests.
Personal Management	• Students will increase their self-esteem and confidence and enhance their ability to set personal goals and priorities. • Students will understand risks and be accountable for their actions.
Working with Others	• Students will practise effective communication skills and strategies in an occupational context. • Students will demonstrate the ability to understand and work within the culture of a group. • Students will plan and make decisions with others.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will orient themselves toward an occupation within an agriculture career environment. • Students will demonstrate basic safe workplace practices and procedures. • Students will develop the knowledge and skills required to identify and care for soil. • Students will develop an understanding of various crops and their economic value. • Students will develop an understanding of livestock care and feeding. • Students will understand marketing principles as they relate to the sale of agricultural products.
Ensuring Quality	• Students will continue to develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will demonstrate effective listening, speaking, reading and writing skills.
Thinking	• Students will apply creative thinking skills to solve problems.
Numeracy	• Students will apply mathematical concepts to solve occupational problems.
Information Technology	• Students will enhance their performance by using information technology to help complete tasks.

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EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will apply their abilities and interests toward achieving learning goals.	**Lifelong Learning** *Students will:* • relate learning preferences and strengths to formal and informal learning opportunities and identify post-secondary opportunities within the related field • assess learning goals and current competencies, identify competencies needing development and identify and prioritize learning goals • create a pathway of senior high school courses to reflect learning goals • identify educational possibilities; e.g., Registered Apprenticeship Program (RAP), Green Certificate, Career and Technology Studies (CTS) and Career Internship.
Students will practise the skills and abilities needed to manage change.	**Adapting to Change** *Students will:* • identify goals, responsibilities and commitments • assess and reflect on the success of an action plan; e.g., – create alternative choices to deal with unexpected change – identify stressors in personal environments that they can and cannot change • identify the need for personal support and create an inventory of available personal and community sources of support.
Students will orient themselves toward an occupation that reflects their personal aptitudes and interests.	**Career Development** *Students will:* • assess work preferences and nonpreferences (e.g., indoor, outdoor, shift work), assess life/work options and outline career goals and paths • work in and seek out a variety of roles and responsibilities • measure and celebrate personal contributions to workplace goals; e.g., paid, unpaid or volunteer work • orient themselves to the workplace through community partnerships and assess personal performance in terms of workplace expectations.

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PERSONAL MANAGEMENT

General Outcomes	Specific Outcomes
Students will increase their self-esteem and confidence and enhance their ability to set personal goals and priorities.	**Self-development** *Students will:* • re-evaluate an action plan to develop strengths and talents • use strengths and talents to achieve personal goals • clarify acceptable and appropriate behaviours for specific activities and roles • act ethically in personal, community and workplace contexts and accept the consequences of their actions.
Students will understand risks and be accountable for their actions.	**Risk Management** *Students will:* • follow health and safety procedures; e.g., at home, at school, in the community and in the workplace • identify potential hazards, take corrective action and develop and practise action plans to ensure safety • practise personal emergency responses • assess their comfort level with, and the consequences of, taking risks.

WORKING WITH OTHERS

Students will practise effective communication skills and strategies in an occupational context.	**Interpersonal Communication** *Students will:* • assess the effectiveness of communication strategies used to communicate thoughts and feelings; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate body language • assess verbal and nonverbal communication strategies • apply social norms to build specific relationships • demonstrate the ability to accept praise and/or criticism.
Students will demonstrate the ability to understand and work within the culture of a group.	**Building Community** *Students will:* • interact with others in a courteous manner • accommodate the beliefs of others in work and personal environments and show respect for differences in beliefs, abilities, etiquette and styles of interaction • identify opportunities for participation in community growth.

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General Outcomes	Specific Outcomes
Students will plan and make decisions with others.	**Teamwork** *Students will:* • participate effectively as group members; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • assume various roles within a group; e.g., leadership • clarify the expected outcomes of teamwork.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will orient themselves toward an occupation within an agriculture career environment.	**Career Awareness** **Orientation** Students will: • identify entry-level competencies • identify post-secondary opportunities • recognize entrepreneurial opportunities within the industry • match their personal interests to their job search; e.g., – identify sources of support for investigating and finding work – describe entry-level requirements – recognize potential career ladders • identify local opportunities within a career field; e.g., – identify local agricultural products – identify local agricultural production and processing occupations • research employment information; e.g., duties, working conditions, personal characteristics, education, salary • define agriculture. **Standards** *Students will:* • develop workplace protocols, procedures and standards of conduct; e.g., – demonstrate appropriate work habits – use safe and sanitary practices – demonstrate pride in themselves – demonstrate pride in their work performance – show respect for others – respect the property of others.

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General Outcomes	Specific Outcomes
Students will demonstrate basic safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify safety device locations and procedures within the workplace environment • demonstrate knowledge of, and the ability to access information about, Occupational Health and Safety (OHS) and the Workers' Compensation Board (WCB) • demonstrate knowledge of, and adherence to, safety rules that are specific to available tools, equipment and materials • demonstrate knowledge of health hazards associated with the use of chemicals and materials and retrieve information on Material Safety Data Sheets (MSDS), using appropriate print and Internet resources • select and wear personal protective equipment (PPE) appropriate to the specific task • demonstrate knowledge of environmental issues relating to the procedures for handling hazardous waste • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements • handle and properly dispose of environmentally hazardous materials • recognize the health and safety hazards associated with farming; e.g., – farm buildings – machines – livestock – personal safety – chemical awareness • identify safety guards, shields, devices and warning signs on farm equipment.
Students will develop the knowledge and skills required to identify and care for soil.	**Land** *Students will:* • list and describe land-produced agricultural products • identify the composition of soil; e.g., mineral and organic content, air, water • take and test soil samples • explain the causes of soil erosion • identify various land-care equipment • describe the physical features of soil; i.e., texture, structure, porosity.

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General Outcomes	Specific Outcomes
Students will develop an understanding of various crops and their economic value.	**Crop Production** *Students will:* • identify the major parts and functions of plants; e.g., roots, stems, leaves, flowers • identify and describe basic plant processes; e.g., – photosynthesis and its place in the food chain – respiration – transpiration • identify local agricultural crops • list plants of economic importance; e.g., – fruit trees – ornamentals – cereals – vegetables – small fruits – trees • identify local agricultural organizations • describe the operation of a grain elevator • identify the processes used to germinate seeds under varied conditions • list the purposes and types of fertilizers • identify the processes used to grow and manage a selected crop; i.e., – prepare the seed bed – seed – cultivate – harvest – store the crop • identify the processes used to grow and manage a variety of crops; e.g., – in a protective environment – in natural environments • describe the reasons for crop rotation • identify dangers to crops; e.g., weather, weeds, insects.

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General Outcomes	Specific Outcomes
Students will develop an understanding of livestock care and feeding.	**Livestock Production** *Students will:* • identify various classes of livestock; e.g., cattle, pigs, sheep, chickens • identify the basic needs of livestock; i.e., food, water, shelter • develop a positive attitude toward livestock care and management; e.g., owner commitment and owner care • recognize methods of handling and showing livestock • recognize the basic principles of livestock nutrition; e.g., identify feed and feeding practices • identify livestock digestive systems; e.g., for ruminants and nonruminants.
Students will understand marketing principles as they relate to the sale of agricultural products.	**Agricultural Marketing** *Students will:* • identify agricultural production-related industries • identify the major determinants of production; e.g., – climate – soil and water – supply and demand – available equipment – labour – transportation • identify current market information/prices; e.g., when to buy, when to sell • identify marketing options when selling agricultural products; e.g., – direct producer marketing – open markets – marketing boards – cooperatives.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will continue to develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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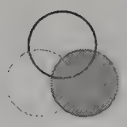

ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will demonstrate effective listening, speaking, reading and writing skills.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret occupation-related materials; e.g., – use related occupational terms – identify occupation-related literature – interpret and follow written instructions • select and create a text format to suit a purpose and audience, e.g., forms, letters, reports, memos, résumés, and: – describe uses of writing skills in related occupations – write a letter of inquiry – write a letter of thanks – complete job applications • listen and present information in a clear, concise manner; e.g., – listen attentively to organize and classify information and ideas – organize main ideas and key messages with clarity.

THINKING

Students will apply creative thinking skills to solve problems.	**Problem Solving, Decision Making and Creative Thinking** *Students will:* • apply a problem-solving model to identify the problem/issue • identify appropriate actions and develop several alternatives for each promising idea • evaluate the results, in terms of expected outcomes related to the initial problem, and evaluate personal satisfaction with the outcome of the idea; e.g., product/process.

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NUMERACY

General Outcomes	Specific Outcomes
Students will apply mathematical concepts to solve occupational problems.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion to solve problems in a meaningful context • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

INFORMATION TECHNOLOGY

Students will enhance their performance by using information technology to help complete tasks.	**Computer Operations and Computer Applications** *Students will:* • demonstrate appropriate language and etiquette when using information technology • demonstrate appropriate telephone operations; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • demonstrate basic computer operations to complete a task; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • demonstrate procedures for connecting and using audio, video and digital equipment • demonstrate procedures for sending and receiving faxes and setting up a fax machine • demonstrate procedures for copying and printing documents.

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AGRICULTURE 30-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will consistently demonstrate personal discovery and continuous learning. • Students will manage change effectively to support their goals. • Students will prepare themselves for entry-level employment in an occupation that reflects their personal aptitudes and interests.
Personal Management	• Students will exhibit self-esteem and confidence through the achievement of personal goals. • Students will manage risks to achieve both personal and workplace goals.
Working with Others	• Students will model effective communication skills and strategies in the home, school, community and workplace. • Students will promote equity in work and community endeavours. • Students will demonstrate the ability to complete tasks in a team environment.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will prepare for entry-level employment within an agriculture career environment. • Students will demonstrate entry-level standards of safe workplace practices and procedures. • Students will develop knowledge and skills to properly prepare soil for agricultural uses. • Students will demonstrate an understanding of crop care and maintenance. • Students will demonstrate an understanding of animal care and ownership. • Students will understand marketing principles as they relate to the sale of agricultural products. • Students will investigate possible entry-level positions within the agriculture industry.
Ensuring Quality	• Students will demonstrate an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will demonstrate effective listening, speaking, reading and writing skills to prepare for employment.
Thinking	• Students will research information, use creative thinking skills and use effective problem-solving strategies to solve problems.
Numeracy	• Students will demonstrate mathematical operations to effectively solve problems in a meaningful context.
Information Technology	• Students will demonstrate the effective use of information technology to perform daily workplace operations.

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EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will consistently demonstrate personal discovery and continuous learning.	**Lifelong Learning** *Students will:* • identify learning opportunities related to learning goals, commitments and resources; e.g., – identify opportunities for further education/training – locate needed financial support systems – locate needed personal support systems • practise what has been learned to build competence and confidence and evaluate the application of competencies to learning goals • create a plan that demonstrates continuous learning; e.g., – analyze requirements for graduation and for further education/training – modify a learning plan to reflect requirements and opportunities.
Students will manage change effectively to support their goals.	**Adapting to Change** *Students will:* • prioritize and assign resources to meet commitments and goals • prioritize commitments and goals to achieve a balanced lifestyle • redefine an action plan as situations change; e.g., – use adaptive strategies – redefine personal goals – select personal coping mechanisms • access available and appropriate sources of support • identify opportunities for improvement and innovation; e.g., entrepreneurship.

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General Outcomes	Specific Outcomes
Students will prepare themselves for entry-level employment in an occupation that reflects their personal aptitudes and interests.	**Career Development** *Students will:* • analyze elements of job satisfaction; e.g., recognition, environment, pay, benefits, prestige • build personal career paths and networks • analyze how work contributes to societal and economic needs and a sense of responsibility • prepare for employment through community partnership activities and organize and complete specific job tasks effectively and efficiently.

PERSONAL MANAGEMENT

Students will exhibit self-esteem and confidence through the achievement of personal goals.	**Self-development** *Students will:* • continue to create a long-term self-development plan in which they consider accomplishments and redefine self-development goals • demonstrate entry-level self-presentation appropriate to the activity and role • maintain a high standard of personal ethics when interacting with others.
Students will manage risks to achieve both personal and workplace goals.	**Risk Management** *Students will:* • maintain health and safety procedures; e.g., at home, at school, in the community and in the workplace • monitor success in reducing the impact of hazards on themselves and others • demonstrate concern for the safety of others by exhibiting appropriate behaviour in the workplace • work with others to respond to emergencies • take planned risks to contribute to personal growth.

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WORKING WITH OTHERS

General Outcomes	Specific Outcomes
Students will model effective communication skills and strategies in the home, school, community and workplace.	**Interpersonal Communication** *Students will:* • communicate thoughts and feelings appropriately; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate body language • maintain a balance between speaking, listening and responding • work together to achieve goals • demonstrate the ability to deal constructively with conflict.
Students will promote equity in work and community endeavours.	**Building Community** *Students will:* • demonstrate and model courteous behaviour in daily interactions • demonstrate respect for others and a shared understanding of diverse beliefs, etiquette and styles of interaction • assess their personal contribution to community growth.
Students will demonstrate the ability to complete tasks in a team environment.	**Teamwork** *Students will:* • assess the effectiveness of group and personal contributions; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • expand their abilities to contribute to team goals.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will prepare for entry-level employment within an agriculture career environment.	**Career Awareness** **Preparation** *Students will:* • assess entry-level competencies • recognize opportunities for further education/training • select post-secondary opportunities • identify local entrepreneurs • establish contacts with local businesses/industries • present marketable skills and strengths; e.g., – write a letter of application – prepare a résumé – complete application forms – identify contacts and references – collect evidence of competencies in a portfolio. **Standards** *Students will:* • demonstrate workplace protocols, procedures and standards of conduct; e.g., – demonstrate appropriate work habits – demonstrate effective human relations techniques in the workplace – practise safety in the workplace – demonstrate acceptable verbal and nonverbal communication skills – practise personal and public hygiene procedures – demonstrate entry-level competency in tools and equipment usage – use supplies correctly – follow good storage practices – demonstrate pride in their work performance – demonstrate a willingness to work – demonstrate respect for others – follow accepted principles and procedures – recognize opportunities for further education/training.

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General Outcomes	Specific Outcomes
Students will demonstrate entry-level standards of safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify and explain the use of safety devices within the workplace • demonstrate knowledge of, and the ability to access information about, Occupational Health and Safety (OHS) and the Workers' Compensation Board (WCB) • demonstrate a prework and postwork hazard assessment • demonstrate knowledge of, and adherence to, safety rules that are specific to available tools, equipment and materials • demonstrate knowledge of health hazards associated with the use of chemicals and materials and retrieve information on Material Safety Data Sheets (MSDS), using appropriate print and Internet resources • model safety consciousness by selecting and wearing personal protective equipment (PPE) appropriate to the specific task • demonstrate knowledge of environmental issues relating to the procedures for handling hazardous waste • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements • recognize the health and safety hazards associated with farming procedures; e.g., machines, livestock, personal safety.
Students will develop knowledge and skills to properly prepare soil for agricultural uses.	**Land** *Students will:* • analyze soil; e.g., pH, organic matter, chemical composition • describe micro-organisms and macro-organisms in soil • demonstrate entry-level operation of fertilizing and land-care equipment • develop an understanding of the storage and handling procedures for various types of fertilizer • identify purposes for cultivating; e.g., – identify operating procedures for cultivating equipment – identify the appropriate width and depth ranges of equipment.

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General Outcomes	Specific Outcomes
Students will demonstrate an understanding of crop care and maintenance.	**Crop Production** *Students will:* • identify weed- and pest-control products • identify safe operation procedures for a variety of crop-production processes, equipment and tools; e.g., – tillage – combine – swathers – forage – seeding • perform basic maintenance on crop-production equipment and tools; e.g., identify proper equipment-storage procedures • identify proper grain-storage procedures • identify cultivation and seeding practices • demonstrate safe work practices • identify the benefits and procedures for setting up irrigation and pumping equipment • describe the purpose of crop insurance.
Students will demonstrate an understanding of animal care and ownership.	**Livestock** *Students will:* • recognize animal identification systems; e.g., tattooing, branding, ear tagging • identify animal health practices; e.g., – castration – dehorning – vaccination – clipping/grooming – shearing – hoof care – parasite control • demonstrate the safe operation of livestock-handling equipment; e.g., squeeze devices, gates, cattle prods • demonstrate the ability to maintain pens and fences • describe the calving process; e.g., identify possible problems that can occur in the calving process.

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General Outcomes	Specific Outcomes
Students will understand marketing principles as they relate to the sale of agricultural products.	**Agricultural Marketing** *Students will:* • identify marketing principles as they relate to the sale of animal-related products; e.g., – supply and demand – product quality – buying practices – advertising – packaging – consumer protection • identify trends in agriculture production in Alberta • identify factors that affect market development; e.g., – demographics – environmental problems – economic issues • identify reasons for change in local production processes • explain how various agricultural products are moved to market • identify market opportunities that arise from product diversification and specialization, international trade and participation in a global economy • identify available government subsidies and grants.
Students will investigate possible entry-level positions within the agriculture industry.	**Agriculture Field Preparation** *Students will:* • identify specific site safety issues, regulations and procedures • identify equipment and machinery used in agricultural production • identify positions and related duties in agricultural: – land use – crop production – livestock care and ownership – marketing.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will demonstrate an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will demonstrate effective listening, speaking, reading and writing skills to prepare for employment.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret occupation-related materials for a specific purpose; e.g., – read related health and safety documents – read terms of employment documents – follow written instructions specific to an occupational area • create text for a specific purpose that clearly communicates information; e.g., – write a résumé – write a job description – submit job application forms • communicate thoughts and ideas and listen to the thoughts and ideas of others to effectively complete a task; e.g., – follow oral instructions – give effective oral instructions when necessary.

THINKING

Students will research information, use creative thinking skills and use effective problem-solving strategies to solve problems.	**Problem Solving, Decision Making, Finding Information and Creative Thinking** *Students will:* • demonstrate an effective problem-solving model; e.g., – identify the need for a solution to a problem/issue – identify why information is needed; e.g., make decisions, inform, persuade • identify appropriate actions and select and apply information that meets their purposes and needs • evaluate the results in terms of expected outcomes and assess the impact of information on their purpose and audience.

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NUMERACY

General Outcomes	Specific Outcomes
Students will demonstrate mathematical operations to effectively solve problems in a meaningful context.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

INFORMATION TECHNOLOGY

Students will demonstrate the effective use of information technology to perform daily workplace operations.	**Computer Operations and Computer Applications** *Students will:* • model and assume personal responsibility for the ethical use of information technologies • demonstrate appropriate telephone operations within the workplace; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • use computer operations to assist in the completion of daily workplace operations; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • demonstrate procedures for connecting and using audio, video and digital equipment • demonstrate procedures for sending and receiving faxes and setting up a fax machine • demonstrate procedures for copying and printing documents.

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FORESTRY 20-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will apply their abilities and interests toward achieving learning goals. • Students will practise the skills and abilities needed to manage change. • Students will orient themselves toward an occupation that reflects their personal aptitudes and interests.
Personal Management	• Students will increase their self-esteem and confidence and enhance their ability to set personal goals and priorities. • Students will understand risks and be accountable for their actions.
Working with Others	• Students will practise effective communication skills and strategies in an occupational context. • Students will demonstrate the ability to understand and work within the culture of a group. • Students will plan and make decisions with others.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will orient themselves toward an occupation within a forestry career environment. • Students will demonstrate basic safe workplace practices and procedures. • Students will demonstrate the functional mapping skills needed for forest location and navigation. • Students will identify the forest-management processes and procedures that create forest sustainability. • Students will identify harvesting procedures as they relate to forestry. • Students will improve their understanding of the milling process.
Ensuring Quality	• Students will continue to develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will demonstrate effective listening, speaking, reading and writing skills.
Thinking	• Students will apply creative thinking skills to solve problems.
Numeracy	• Students will apply mathematical concepts to solve occupational problems.
Information Technology	• Students will enhance their performance by using information technology to help complete tasks.

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EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will apply their abilities and interests toward achieving learning goals.	**Lifelong Learning** *Students will:* • relate learning preferences and strengths to formal and informal learning opportunities and identify post-secondary opportunities within the related field • assess learning goals and current competencies, identify competencies needing development and identify and prioritize learning goals • create a pathway of senior high school courses to reflect learning goals • identify educational possibilities; e.g., Registered Apprenticeship Program (RAP), Green Certificate, Career and Technology Studies (CTS) and Career Internship.
Students will practise the skills and abilities needed to manage change.	**Adapting to Change** *Students will:* • identify goals, responsibilities and commitments • assess and reflect on the success of an action plan; e.g., – create alternative choices to deal with unexpected change – identify stressors in personal environments that they can and cannot change • identify the need for personal support and create an inventory of available personal and community sources of support.
Students will orient themselves toward an occupation that reflects their personal aptitudes and interests.	**Career Development** *Students will:* • assess work preferences and nonpreferences (e.g., indoor, outdoor, shift work), assess life/work options and outline career goals and paths • work in and seek out a variety of roles and responsibilities • measure and celebrate personal contributions to workplace goals; e.g., paid, unpaid or volunteer work • orient themselves to the workplace through community partnerships and assess personal performance in terms of workplace expectations.

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PERSONAL MANAGEMENT

General Outcomes	Specific Outcomes
Students will increase their self-esteem and confidence and enhance their ability to set personal goals and priorities.	**Self-development** *Students will:* • re-evaluate an action plan to develop strengths and talents • use strengths and talents to achieve personal goals • clarify acceptable and appropriate behaviours for specific activities and roles • act ethically in personal, community and workplace contexts and accept the consequences of their actions.
Students will understand risks and be accountable for their actions.	**Risk Management** *Students will:* • follow health and safety procedures; e.g., at home, at school, in the community and in the workplace • identify potential hazards, take corrective action and develop and practise action plans to ensure safety • practise personal emergency responses • assess their comfort level with, and the consequences of, taking risks.

WORKING WITH OTHERS

Students will practise effective communication skills and strategies in an occupational context.	**Interpersonal Communication** *Students will:* • assess the effectiveness of communication strategies used to communicate thoughts and feelings; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate body language • assess verbal and nonverbal communication strategies • apply social norms to build specific relationships • demonstrate the ability to accept praise and/or criticism.
Students will demonstrate the ability to understand and work within the culture of a group.	**Building Community** *Students will:* • interact with others in a courteous manner • accommodate the beliefs of others in work and personal environments and show respect for differences in beliefs, abilities, etiquette and styles of interaction • identify opportunities for participation in community growth.

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General Outcomes	Specific Outcomes
Students will plan and make decisions with others.	**Teamwork** *Students will:* • participate effectively as group members; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • assume various roles within a group; e.g., leadership • clarify the expected outcomes of teamwork.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will orient themselves toward an occupation within a forestry career environment.	**Career Awareness** **Orientation** *Students will:* • identify entry-level competencies • identify post-secondary opportunities • recognize entrepreneurial opportunities within the industry • introduce themselves to local business/industry operations • match their personal interests to their job search; e.g., – identify sources of support for investigating and finding work – describe entry-level requirements – recognize potential career ladders. **Standards** *Students will:* • develop workplace protocols, procedures and standards of conduct; e.g., – demonstrate appropriate work habits – use safe and sanitary practices – demonstrate pride in themselves – demonstrate pride in their work performance – show respect for others – respect the property of others.
Students will demonstrate basic safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify safety device locations and procedures within the workplace environment • demonstrate knowledge of, and the ability to access information about, Occupational Health and Safety (OHS) and the Workers' Compensation Board (WCB) • demonstrate knowledge of, and adherence to, safety rules that are specific to available tools, equipment and materials

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General Outcomes	Specific Outcomes
	• demonstrate knowledge of health hazards associated with the use of chemicals and materials and retrieve information on Material Safety Data Sheets (MSDS), using appropriate print and Internet resources • select and wear personal protective equipment (PPE) appropriate to the specific task • demonstrate knowledge of environmental issues relating to the procedures for handling hazardous waste • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements • handle and properly dispose of environmentally hazardous materials • recognize the health and safety hazards associated with forestry procedures; e.g., – hand and tool safety – power tools; e.g., chain saws – small motorized vehicles; e.g., ATVs – heavy duty equipment operation.
Students will demonstrate the functional mapping skills needed for forest location and navigation.	**Topographical Mapping** *Students will:* • identify locations, using various map types; e.g., – topographical or contour – base – soil type – geological – forest stands or types – road • use technology to identify locations and find directions; e.g., global positioning system (GPS), computer software • use satellite imagery and aerial photographs to locate specific crop clusters • measure horizontal distance in the forest, using pacing and chaining skills • apply basic compass skills to establish direction in the forest; e.g., orient a map, establish and follow a bearing.

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General Outcomes	Specific Outcomes
Students will identify the forest-management processes and procedures that create forest sustainability.	**Forest Management** **Fighting Fires** *Students will:* • distinguish between natural and man-made fires • recognize and understand aspects of provincial firefighting budgets • identify training and employment opportunities for firefighters • identify typical firefighting equipment; e.g., – PPE – respirator – axe, shovel – ropes – hoses and water pumps – first aid – vehicles and aircraft • identify fire-prevention methods; e.g., fighting, clean-up, hot spots • identify firefighting procedures; e.g., – use of firebreaks – ground-attack firefighting – trenching – aerial bombing with water and chemical fire retardants – controlled backburning. **Conservation** *Students will:* • compare the different uses of forested regions in terms of their advantages and disadvantages; e.g., environmental, economic, social • explain the demands that are placed on forested regions in Alberta and Canada; e.g., – industry – recreation – wildlife – environment • describe the roles of different interest groups in managing the forest resource; e.g., – government – forest industry – general public – other stakeholder groups.

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General Outcomes	Specific Outcomes
Students will identify harvesting procedures as they relate to forestry.	**Harvesting** **Species Identification** *Students will:* • identify a variety of Alberta tree species; e.g., mapping species across the province • identify applications for different types of wood • identify the age and quality of various species; e.g., scaling. **Tools and Equipment** *Students will:* • identify harvesting processes and equipment, from cutting down the tree to milling the wood; e.g., – chain saw; e.g., falling, bucking and delimbing a tree – heavy equipment; e.g., shudder, loaders, skidders, bunchers and onsite chipping • identify the advantages and disadvantages of various harvesting methods • identify the techniques and equipment used to transport logs to a sawmill; e.g., compare the use of horses with mechanical methods of transportation • recognize the implications of seasonal cutting requirements • define forest harvesting concepts and practices; i.e., sustainable yield, allowable cut, multiple use.
Students will improve their understanding of the milling process.	**Processing** *Students will:* • identify common hand and power tools and equipment used in milling processes • identify the methods used to process logs into usable lumber; e.g., – identify Canadian industry standards as they relate to length and cutting sizes – describe product evaluation methods • describe transportation and storage methods; e.g., identify stacking methods • identify the marketable products that are derived from all parts of the log • identify the technology used to process, refine and upgrade timber products • identify consumer trends and practices; e.g., – product quality – buying practices – advertising – packaging.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will continue to develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will demonstrate effective listening, speaking, reading and writing skills.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret occupation-related materials; e.g., – use related occupational terms – identify occupation-related literature – interpret and follow written instructions • select and create a text format to suit a purpose and audience, e.g., forms, letters, reports, memos, résumés, and: – describe uses of writing skills in related occupations – write a letter of inquiry – write a letter of thanks – complete job applications • listen and present information in a clear, concise manner; e.g., – listen attentively to organize and classify information and ideas – organize main ideas and key messages with clarity.

THINKING

Students will apply creative thinking skills to solve problems.	**Problem Solving, Decision Making and Creative Thinking** *Students will:* • apply a problem-solving model to identify the problem/issue • identify appropriate actions and develop several alternatives for each promising idea • evaluate the results, in terms of expected outcomes related to the initial problem, and evaluate personal satisfaction with the outcome of the idea; e.g., product/process.

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NUMERACY

General Outcomes	Specific Outcomes
Students will apply mathematical concepts to solve occupational problems.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion to solve problems in a meaningful context • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

INFORMATION TECHNOLOGY

Students will enhance their performance by using information technology to help complete tasks.	**Computer Operations and Computer Applications** *Students will:* • demonstrate appropriate language and etiquette when using information technology • demonstrate appropriate telephone operations; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • demonstrate basic computer operations to complete a task; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • demonstrate procedures for connecting and using audio, video and digital equipment • demonstrate procedures for sending and receiving faxes and setting up a fax machine • demonstrate procedures for copying and printing documents.

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FORESTRY 30-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will consistently demonstrate personal discovery and continuous learning. • Students will manage change effectively to support their goals. • Students will prepare themselves for entry-level employment in an occupation that reflects their personal aptitudes and interests.
Personal Management	• Students will exhibit self-esteem and confidence through the achievement of personal goals. • Students will manage risks to achieve both personal and workplace goals.
Working with Others	• Students will model effective communication skills and strategies in the home, school, community and workplace. • Students will promote equity in work and community endeavours. • Students will demonstrate the ability to complete tasks in a team environment.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will prepare for entry-level employment within a forestry career environment. • Students will demonstrate entry-level standards of safe workplace practices and procedures. • Students will demonstrate entry-level procedures for the measuring and surveying of potential land samples. • Students will identify entry-level forest-management policies and procedures. • Students will identify entry-level duties in the forestry industry.
Ensuring Quality	• Students will demonstrate an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will demonstrate effective listening, speaking, reading and writing skills to prepare for employment.
Thinking	• Students will research information, use creative thinking skills and use effective problem-solving strategies to solve problems.
Numeracy	• Students will demonstrate mathematical operations to effectively solve problems in a meaningful context.
Information Technology	• Students will demonstrate the effective use of information technology to perform daily workplace operations.

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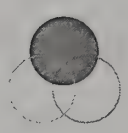

EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will consistently demonstrate personal discovery and continuous learning.	**Lifelong Learning** *Students will:* • identify learning opportunities related to learning goals, commitments and resources; e.g., – identify opportunities for further education/training – locate needed financial support systems – locate needed personal support systems • practise what has been learned to build competence and confidence and evaluate the application of competencies to learning goals • create a plan that demonstrates continuous learning; e.g., – analyze requirements for graduation and for further education/training – modify a learning plan to reflect requirements and opportunities.
Students will manage change effectively to support their goals.	**Adapting to Change** *Students will:* • prioritize and assign resources to meet commitments and goals • prioritize commitments and goals to achieve a balanced lifestyle • redefine an action plan as situations change; e.g., – use adaptive strategies – redefine personal goals – select personal coping mechanisms • access available and appropriate sources of support • identify opportunities for improvement and innovation; e.g., entrepreneurship.

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General Outcomes	Specific Outcomes
Students will prepare themselves for entry-level employment in an occupation that reflects their personal aptitudes and interests.	**Career Development** *Students will:* • analyze elements of job satisfaction; e.g., recognition, environment, pay, benefits, prestige • build personal career paths and networks • analyze how work contributes to societal and economic needs and a sense of responsibility • prepare for employment through community partnership activities and organize and complete specific job tasks effectively and efficiently.

PERSONAL MANAGEMENT

Students will exhibit self-esteem and confidence through the achievement of personal goals.	**Self-development** *Students will:* • continue to create a long-term self-development plan in which they consider accomplishments and redefine self-development goals • demonstrate entry-level self-presentation appropriate to the activity and role • maintain a high standard of personal ethics when interacting with others.
Students will manage risks to achieve both personal and workplace goals.	**Risk Management** *Students will:* • maintain health and safety procedures; e.g., at home, at school, in the community and in the workplace • monitor success in reducing the impact of hazards on themselves and others • demonstrate concern for the safety of others by exhibiting appropriate behaviour in the workplace • work with others to respond to emergencies • take planned risks to contribute to personal growth.

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WORKING WITH OTHERS

General Outcomes	Specific Outcomes
Students will model effective communication skills and strategies in the home, school, community and workplace.	**Interpersonal Communication** *Students will:* • communicate thoughts and feelings appropriately; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate body language • maintain a balance between speaking, listening and responding • work together to achieve goals • demonstrate the ability to deal constructively with conflict.
Students will promote equity in work and community endeavours.	**Building Community** *Students will:* • demonstrate and model courteous behaviour in daily interactions • demonstrate respect for others and a shared understanding of diverse beliefs, etiquette and styles of interaction • assess their personal contribution to community growth.
Students will demonstrate the ability to complete tasks in a team environment.	**Teamwork** *Students will:* • assess the effectiveness of group and personal contributions; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • expand their abilities to contribute to team goals.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will prepare for entry-level employment within a forestry career environment.	**Career Awareness** **Preparation** *Students will:* • assess entry-level competencies • recognize opportunities for further education/training • select post-secondary opportunities • identify local entrepreneurs • establish contacts with local businesses/industries • present marketable skills and strengths; e.g., – write a letter of application – prepare a résumé – complete application forms – identify contacts and references – collect evidence of competencies in a portfolio. **Standards** *Students will:* • demonstrate workplace protocols, procedures and standards of conduct; e.g., – demonstrate appropriate work habits – demonstrate effective human relations techniques in the workplace – practise safety in the workplace – demonstrate acceptable verbal and nonverbal communication skills – practise personal and public hygiene procedures – demonstrate entry-level competency in tools and equipment usage – use supplies correctly – follow good storage practices – demonstrate pride in their work performance – demonstrate a willingness to work – demonstrate respect for others – follow accepted principles and procedures – recognize opportunities for further education/training.

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General Outcomes	Specific Outcomes
Students will demonstrate entry-level standards of safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify and explain the use of safety devices within the workplace • demonstrate knowledge of, and the ability to access information about, Occupational Health and Safety (OHS) and the Workers' Compensation Board (WCB) • demonstrate a prework and postwork hazard assessment • demonstrate knowledge of, and adherence to, safety rules that are specific to available tools, equipment and materials • demonstrate knowledge of health hazards associated with the use of chemicals and materials and retrieve information on Material Safety Data Sheets (MSDS), using appropriate print and Internet resources • model safety consciousness by selecting and wearing personal protective equipment (PPE) appropriate to the specific task • demonstrate knowledge of environmental issues relating to the procedures for handling hazardous waste • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements • recognize the health and safety hazards associated with forestry procedures; e.g., – hand tool safety – power tools; e.g., chain saw – small motorized vehicles; e.g., ATVs, snowmobiles – heavy duty equipment operation.
Students will demonstrate entry-level procedures for the measuring and surveying of potential land samples.	**Data Interpretation and Evaluation** **Photograph Interpretation** *Students will:* • identify the procedures for reading and interpreting aerial photographs • evaluate photographs to identify the species to be harvested • evaluate the species to be harvested • identify, from an aerial photograph, the potential number of trees to be harvested. **Satellite and Global Positioning System (GPS)** *Students will:* • identify satellite and GPS applications within the forestry industry.

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General Outcomes	Specific Outcomes
	Timber Cruising *Students will:* • identify preharvest survey procedures; e.g., – choose a sample location, using either the quadrant or the line transect method – identify the number and species of trees in the sample location – determine the volume of each tree within the sample area – compile the sampled data as required to estimate fibre volume – create a grid of the sample location • demonstrate hands-on measurement and identification of plant species • demonstrate survey procedures, using data-interpretation techniques. **Regeneration Survey** *Students will:* • recognize what existing species were identified in a timber cruise • demonstrate tree-planting methodology; e.g., – evaluate cut land to determine what species would best grow there – evaluate new growth.
Students will identify entry-level forest-management policies and procedures.	**Forest Management** **Forest Fire Trends** *Students will:* • review fire history maps and look for short-term and long-term fire patterns • compare the total annual area affected by forest fires to the amount of area harvested annually • explain the idea of succession as it pertains to forest ecosystems affected by forest fires. **Training and Employment** *Students will:* • identify entry-level training and employment opportunities • identify working conditions • identify occupational and employment outlooks. **Characteristics** *Students will:* • identify the characteristics of ground fires, surface fires and crown fires • evaluate the results of fires on forests • identify methods of combatting forest fires.

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General Outcomes	Specific Outcomes
	Conservation officers *Students will:* • identify the role and responsibilities of forest rangers; e.g., describe forest and community protection • describe the function of ranger stations. **Forest Ecology** *Students will:* • define forest succession • list wildlife habitat requirements • list the major interrelationships among various animals/humans in a given ecosystem • recognize the value of controlled burning to regenerate the natural growth process.
Students will identify entry-level duties in the forestry industry.	**Forestry Field Preparation** *Students will:* • identify the duties of a crew worker • identify the duties of an equipment operator; e.g., licence classification, hydraulics and heavy equipment • identify bush-survival and woodsmanship techniques; e.g., using a compass • demonstrate the ability to plant seedlings • identify the safe use of hand and power tools and motorized equipment; e.g., – snowmobiles – all-terrain vehicles (ATVs) – four-wheel drive vehicles • identify personal emergency preparedness procedures. **Camp Life** *Students will:* • identify what it is like to live in a work camp • identify camp rules and roles • identify unwritten rules of camp conduct • identify communication protocols; e.g., use of CB equipment, communication etiquette • identify camp hazard assessments and hazard controls.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will demonstrate an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will demonstrate effective listening, speaking, reading and writing skills to prepare for employment.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret occupation-related materials for a specific purpose; e.g., – read related health and safety documents – read terms of employment documents – follow written instructions specific to an occupational area • create text for a specific purpose that clearly communicates information; e.g., – write a résumé – write a job description – submit job application forms • communicate thoughts and ideas and listen to the thoughts and ideas of others to effectively complete a task; e.g., – follow oral instructions – give effective oral instructions when necessary.

THINKING

Students will research information, use creative thinking skills and use effective problem-solving strategies to solve problems.	**Problem Solving, Decision Making, Finding Information and Creative Thinking** *Students will:* • demonstrate an effective problem-solving model; e.g., – identify the need for a solution to a problem/issue – identify why information is needed; e.g., make decisions, inform, persuade • identify appropriate actions and select and apply information that meets their purposes and needs • evaluate the results in terms of expected outcomes and assess the impact of information on their purpose and audience.

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NUMERACY

General Outcomes	Specific Outcomes
Students will demonstrate mathematical operations to effectively solve problems in a meaningful context.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

INFORMATION TECHNOLOGY

Students will demonstrate the effective use of information technology to perform daily workplace operations.	**Computer Operations and Computer Applications** *Students will:* • model and assume personal responsibility for the ethical use of information technologies • demonstrate appropriate telephone operations within the workplace; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • use computer operations to assist in the completion of daily workplace operations; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • demonstrate procedures for connecting and using audio, video and digital equipment • demonstrate procedures for sending and receiving faxes and setting up a fax machine • demonstrate procedures for copying and printing documents.

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OIL AND GAS 20-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will apply their abilities and interests toward achieving learning goals. • Students will practise the skills and abilities needed to manage change. • Students will orient themselves toward an occupation that reflects their personal aptitudes and interests.
Personal Management	• Students will increase their self-esteem and confidence and enhance their ability to set personal goals and priorities. • Students will understand risks and be accountable for their actions.
Working with Others	• Students will practise effective communication skills and strategies in an occupational context. • Students will demonstrate the ability to understand and work within the culture of a group. • Students will plan and make decisions with others.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will orient themselves toward an occupation within an oil and gas career environment. • Students will demonstrate basic safe workplace practices and procedures. • Students will demonstrate the functional mapping skills needed for resource location and navigation. • Students will gain a practical understanding of the oil and gas industry in Alberta. • Students will develop a basic understanding of the processing of oil and natural gas.
Ensuring Quality	• Students will continue to develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will demonstrate effective listening, speaking, reading and writing skills.
Thinking	• Students will apply creative thinking skills to solve problems.
Numeracy	• Students will apply mathematical concepts to solve occupational problems.
Information Technology	• Students will enhance their performance by using information technology to help complete tasks.

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EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will apply their abilities and interests toward achieving learning goals.	**Lifelong Learning** *Students will:* • relate learning preferences and strengths to formal and informal learning opportunities and identify post-secondary opportunities within the related field • assess learning goals and current competencies, identify competencies needing development and identify and prioritize learning goals • create a pathway of senior high school courses to reflect learning goals • identify educational possibilities; e.g., Registered Apprenticeship Program (RAP), Green Certificate, Career and Technology Studies (CTS) and Career Internship.
Students will practise the skills and abilities needed to manage change.	**Adapting to Change** *Students will:* • identify goals, responsibilities and commitments • assess and reflect on the success of an action plan; e.g., – create alternative choices to deal with unexpected change – identify stressors in personal environments that they can and cannot change • identify the need for personal support and create an inventory of available personal and community sources of support.
Students will orient themselves toward an occupation that reflects their personal aptitudes and interests.	**Career Development** *Students will:* • assess work preferences and nonpreferences (e.g., indoor, outdoor, shift work), assess life/work options and outline career goals and paths • work in and seek out a variety of roles and responsibilities • measure and celebrate personal contributions to workplace goals; e.g., paid, unpaid or volunteer work • orient themselves to the workplace through community partnerships and assess personal performance in terms of workplace expectations.

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PERSONAL MANAGEMENT

General Outcomes	Specific Outcomes
Students will increase their self-esteem and confidence and enhance their ability to set personal goals and priorities.	**Self-development** *Students will:* • re-evaluate an action plan to develop strengths and talents • use strengths and talents to achieve personal goals • clarify acceptable and appropriate behaviours for specific activities and roles • act ethically in personal, community and workplace contexts and accept the consequences of their actions.
Students will understand risks and be accountable for their actions.	**Risk Management** *Students will:* • follow health and safety procedures; e.g., at home, at school, in the community and in the workplace • identify potential hazards, take corrective action and develop and practise action plans to ensure safety • practise personal emergency responses • assess their comfort level with, and the consequences of, taking risks.

WORKING WITH OTHERS

Students will practise effective communication skills and strategies in an occupational context.	**Interpersonal Communication** *Students will:* • assess the effectiveness of communication strategies used to communicate thoughts and feelings; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate body language • assess verbal and nonverbal communication strategies • apply social norms to build specific relationships • demonstrate the ability to accept praise and/or criticism.
Students will demonstrate the ability to understand and work within the culture of a group.	**Building Community** *Students will:* • interact with others in a courteous manner • accommodate the beliefs of others in work and personal environments and show respect for differences in beliefs, abilities, etiquette and styles of interaction • identify opportunities for participation in community growth.

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General Outcomes	Specific Outcomes
Students will plan and make decisions with others.	**Teamwork** *Students will:* • participate effectively as group members; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • assume various roles within a group; e.g., leadership • clarify the expected outcomes of teamwork.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will orient themselves toward an occupation within an oil and gas career environment.	**Career Awareness** **Orientation** *Students will:* • identify entry-level competencies • identify post-secondary opportunities • recognize entrepreneurial opportunities within the industry • match their personal interests to their job search; e.g., – identify sources of support for investigating and finding work – describe entry-level requirements – recognize potential career ladders • identify local opportunities within a career field; e.g., – identify local oil and gas products – identify local oil and gas production and processing occupations • research employment information; e.g., duties, working conditions, personal characteristics, education, salary • define oil and gas. **Standards** *Students will:* • develop workplace protocols, procedures and standards of conduct; e.g., – demonstrate appropriate work habits – use safe and sanitary practices – demonstrate pride in themselves – demonstrate pride in their work performance – show respect for others – respect the property of others.

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General Outcomes	Specific Outcomes
Students will demonstrate basic safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify safety device locations and procedures within the workplace environment • demonstrate knowledge of, and the ability to access information about, Occupational Health and Safety (OHS) and the Workers' Compensation Board (WCB) • demonstrate knowledge of, and adherence to, safety rules that are specific to available tools, equipment and materials • demonstrate knowledge of health hazards associated with the use of chemicals and materials and retrieve information on Material Safety Data Sheets (MSDS), using appropriate print and Internet resources • select and wear personal protective equipment (PPE) appropriate to the specific task • demonstrate knowledge of environmental issues relating to the procedures for handling hazardous waste • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements • handle and properly dispose of environmentally hazardous materials • recognize health and safety hazards associated with oil recovery procedures; e.g., – hand and tool safety – electricity – small motorized vehicles; e.g., ATVs – heavy duty equipment operation • recognize the safety regulations of petroleum-based industries.
Students will demonstrate the functional mapping skills needed for resource location and navigation.	**Topographical Mapping** *Students will:* • identify locations, using various map types; e.g., – topographical or contour – base – soil type – geological – forest stands or types – road • use technology to identify locations and find directions; e.g., global positioning system (GPS), computer software • use satellite imagery and aerial photographs to locate specific oil and gas clusters • apply basic compass skills to establish direction; e.g., orient a map, establish and follow a bearing.

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General Outcomes	Specific Outcomes
Students will gain a practical understanding of the oil and gas industry in Alberta.	**Resource Management** **Exploration** *Students will:* • identify oil- and gas-producing areas in Alberta; e.g., well location identification system • describe petroleum-bearing formations in oil- and gas-producing areas in Alberta; e.g., demonstrate familiarity with the various types of oil traps • differentiate between oil and gas • identify the tools and equipment used in locating oil and gas • identify career opportunities within the area of energy resource exploration. **Extraction** *Students will:* • identify the methods used to extract energy resources from the ground; e.g., drilling, mining • identify tools and equipment used in energy resource extraction • describe site preparation; e.g., – scrapers – bulldozers – draglines – drilling, augers, conveyor belts – hand tools and safety equipment – seismic tools – wireline/down hole tools • describe the standard operations of a typical producing well (both oil and gas); e.g., – purpose of drilling – method of drilling – types of recovery methods; e.g., free-flowing wells and wells that require pumps and pump jacks • identify career opportunities within the area of oil and gas extraction.

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General Outcomes	Specific Outcomes
Students will develop a basic understanding of the processing of oil and natural gas.	**Processing** **Transmission** *Students will:* • identify oil and gas transportation systems, from the lease (well site) to the processing plant • describe the layout of a pipeline system that is used to transport conventional oil or gas; e.g., identify the two Canadian pipeline systems (crude oil and natural gas), their sources and their destinations • explain the mechanics of the movement of oil and gas through pipelines; e.g., the function of pump jacks and compressor stations • describe different types of field storage facilities • describe well site and satellite facilities uses and processes; e.g., – separation – dehydration – heating – measurement – computer systems. **Refining** *Students will:* • explain the crude oil-refining process • explain the gas-refining process • identify what end products are created from the refining process; e.g., fuels and petrochemicals.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will continue to develop an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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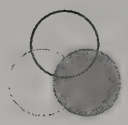

ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will demonstrate effective listening, speaking, reading and writing skills.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret occupation-related materials; e.g., – use related occupational terms – identify occupation-related literature – interpret and follow written instructions • select and create a text format to suit a purpose and audience, e.g., forms, letters, reports, memos, résumés, and: – describe uses of writing skills in related occupations – write a letter of inquiry – write a letter of thanks – complete job applications • listen and present information in a clear, concise manner; e.g., – listen attentively to organize and classify information and ideas – organize main ideas and key messages with clarity.

THINKING

Students will apply creative thinking skills to solve problems.	**Problem Solving, Decision Making and Creative Thinking** *Students will:* • apply a problem-solving model to identify the problem/issue • identify appropriate actions and develop several alternatives for each promising idea • evaluate the results, in terms of expected outcomes related to the initial problem, and evaluate personal satisfaction with the outcome of the idea; e.g., product/process.

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NUMERACY

General Outcomes	Specific Outcomes
Students will apply mathematical concepts to solve occupational problems.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion to solve problems in a meaningful context • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

INFORMATION TECHNOLOGY

Students will enhance their performance by using information technology to help complete tasks.	**Computer Operations and Computer Applications** *Students will:* • demonstrate appropriate language and etiquette when using information technology • demonstrate appropriate telephone operations; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • demonstrate basic computer operations to complete a task; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • demonstrate procedures for connecting and using audio, video and digital equipment • demonstrate procedures for sending and receiving faxes and setting up a fax machine • demonstrate procedures for copying and printing documents.

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OIL AND GAS 30-4
GENERAL OUTCOMES

Employability Competencies	**Students will develop these competencies throughout the learning process and demonstrate them in daily life and the workplace.**
Managing Transitions	• Students will consistently demonstrate personal discovery and continuous learning. • Students will manage change effectively to support their goals. • Students will prepare themselves for entry-level employment in an occupation that reflects their personal aptitudes and interests.
Personal Management	• Students will exhibit self-esteem and confidence through the achievement of personal goals. • Students will manage risks to achieve both personal and workplace goals.
Working with Others	• Students will model effective communication skills and strategies in the home, school, community and workplace. • Students will promote equity in work and community endeavours. • Students will demonstrate the ability to complete tasks in a team environment.
Occupational Competencies	**Students will develop and demonstrate the following competencies to succeed in a specific occupation or career.**
Achieving Results	• Students will prepare for entry-level employment within an oil and gas career environment. • Students will demonstrate entry-level standards of safe workplace practices and procedures. • Students will demonstrate entry-level competencies in practical oil and gas industry skills. • Students will investigate the environmental effects of oil and gas exploration, drilling, extraction, transportation and processing. • Students will investigate possible entry-level positions within the oil and gas industry.
Ensuring Quality	• Students will demonstrate an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.
Academic Competencies	**Students will continue to develop these minimum academic competencies that provide a foundation for further learning.**
Communication	• Students will demonstrate effective listening, speaking, reading and writing skills to prepare for employment.
Thinking	• Students will research information, use creative thinking skills and use effective problem-solving strategies to solve problems.
Numeracy	• Students will demonstrate mathematical operations to effectively solve problems in a meaningful context.
Information Technology	• Students will demonstrate the effective use of information technology to perform daily workplace operations.

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EMPLOYABILITY COMPETENCIES: These competencies are developed throughout the learning process and are demonstrated in daily life and the workplace. Students will develop and demonstrate these competencies through individual effort and interpersonal interaction while completing a variety of projects/activities.

MANAGING TRANSITIONS

General Outcomes	Specific Outcomes
Students will consistently demonstrate personal discovery and continuous learning.	**Lifelong Learning** *Students will:* • identify learning opportunities related to learning goals, commitments and resources; e.g., – identify opportunities for further education/training – locate needed financial support systems – locate needed personal support systems • practise what has been learned to build competence and confidence and evaluate the application of competencies to learning goals • create a plan that demonstrates continuous learning; e.g., – analyze requirements for graduation and for further education/training – modify a learning plan to reflect requirements and opportunities.
Students will manage change effectively to support their goals.	**Adapting to Change** *Students will:* • prioritize and assign resources to meet commitments and goals • prioritize commitments and goals to achieve a balanced lifestyle • redefine an action plan as situations change; e.g., – use adaptive strategies – redefine personal goals – select personal coping mechanisms • access available and appropriate sources of support • identify opportunities for improvement and innovation; e.g., entrepreneurship.

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General Outcomes	Specific Outcomes
Students will prepare themselves for entry-level employment in an occupation that reflects their personal aptitudes and interests.	**Career Development** *Students will:* • analyze elements of job satisfaction; e.g., recognition, environment, pay, benefits, prestige • build personal career paths and networks • analyze how work contributes to societal and economic needs and a sense of responsibility • prepare for employment through community partnership activities and organize and complete specific job tasks effectively and efficiently.

PERSONAL MANAGEMENT

Students will exhibit self-esteem and confidence through the achievement of personal goals.	**Self-development** *Students will:* • continue to create a long-term self-development plan in which they consider accomplishments and redefine self-development goals • demonstrate entry-level self-presentation appropriate to the activity and role • maintain a high standard of personal ethics when interacting with others.
Students will manage risks to achieve both personal and workplace goals.	**Risk Management** *Students will:* • maintain health and safety procedures; e.g., at home, at school, in the community and in the workplace • monitor success in reducing the impact of hazards on themselves and others • demonstrate concern for the safety of others by exhibiting appropriate behaviour in the workplace • work with others to respond to emergencies • take planned risks to contribute to personal growth.

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WORKING WITH OTHERS

General Outcomes	Specific Outcomes
Students will model effective communication skills and strategies in the home, school, community and workplace.	**Interpersonal Communication** *Students will:* • communicate thoughts and feelings appropriately; e.g., – listen without interrupting – contribute to be heard – disagree courteously – accept conflicting opinions – use appropriate body language • maintain a balance between speaking, listening and responding • work together to achieve goals • demonstrate the ability to deal constructively with conflict.
Students will promote equity in work and community endeavours.	**Building Community** *Students will:* • demonstrate and model courteous behaviour in daily interactions • demonstrate respect for others and a shared understanding of diverse beliefs, etiquette and styles of interaction • assess their personal contribution to community growth.
Students will demonstrate the ability to complete tasks in a team environment.	**Teamwork** *Students will:* • assess the effectiveness of group and personal contributions; e.g., – generate ideas – assess resources – contribute abilities and interests – monitor progress – share responsibility for completion of a task • expand their abilities to contribute to team goals.

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OCCUPATIONAL COMPETENCIES: Students will develop and demonstrate the following competencies to succeed in a specific occupation or career. They will achieve results through a variety of projects/activities as appropriate to enhance their knowledge and skills. Students will ensure the quality of their work through effective task management and will highlight their achievements in a career-based portfolio.

ACHIEVING RESULTS

General Outcomes	Specific Outcomes
Students will prepare for entry-level employment within an oil and gas career environment.	**Career Awareness** **Preparation** *Students will:* • assess entry-level competencies • recognize opportunities for further education/training • select post-secondary opportunities • identify local entrepreneurs • establish contacts with local businesses/industries • present marketable skills and strengths; e.g., – write a letter of application – prepare a résumé – complete application forms – identify contacts and references – collect evidence of competencies in a portfolio. **Standards** *Students will:* • demonstrate workplace protocols, procedures and standards of conduct; e.g., – demonstrate appropriate work habits – demonstrate effective human relations techniques in the workplace – practise safety in the workplace – demonstrate acceptable verbal and nonverbal communication skills – practise personal and public hygiene procedures – demonstrate entry-level competency in tools and equipment usage – use supplies correctly – follow good storage practices – demonstrate pride in their work performance – demonstrate a willingness to work – demonstrate respect for others – follow accepted principles and procedures – recognize opportunities for further education/training.

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General Outcomes	Specific Outcomes
Students will demonstrate entry-level standards of safe workplace practices and procedures.	**Workplace Health and Safety** *Students will:* • identify and explain the use of safety devices within the workplace • demonstrate knowledge of, and the ability to access information about, Occupational Health and Safety (OHS) and the Workers' Compensation Board (WCB) • demonstrate a prework and postwork hazard assessment • demonstrate knowledge of, and adherence to, safety rules that are specific to available tools, equipment and materials • demonstrate knowledge of health hazards associated with the use of chemicals and materials and retrieve information on Material Safety Data Sheets (MSDS), using appropriate print and Internet resources • model safety consciousness by selecting and wearing personal protective equipment (PPE) appropriate to the specific task • demonstrate knowledge of environmental issues relating to the procedures for handling hazardous waste • demonstrate an understanding of the Workplace Hazardous Materials Information System (WHMIS) as it relates to the field of study and identify WHMIS symbols, classes and labelling requirements • recognize the health and safety hazards associated with oil and gas procedures; e.g., – hand tool safety – power tools; e.g., chain saw – small motorized vehicles; e.g., ATVs, snowmobiles – heavy duty equipment; e.g., generators, compressors.
Students will demonstrate entry-level competencies in practical oil and gas industry skills.	**Data Interpretation and Measurement** *Students will:* • demonstrate practical skills when using the reading and measuring tools commonly used in the oil and gas industry; e.g., – demonstrate processes for reading gauges, meters – demonstrate conversion methods • describe the processes used for tracking the production and distribution of a product • identify the use of computer systems in the production process.

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General Outcomes	Specific Outcomes
Students will investigate the environmental effects of oil and gas exploration, drilling, extraction, transportation and processing.	**Resource Management** **Environmental Safety Hazards** *Students will:* • understand applicable environmental legislation • identify waste management programs and controls; e.g., identify the consequences that result when these programs fail • identify environmental hazards; e.g., – toxic emissions and disposal – noise pollution – land/wildlife (reclamation) • identify industry regulations that address the transportation of dangerous goods • identify environmental protection procedures; e.g., safety procedures, blow-out prevention. **Economic Perspectives** *Students will:* • discuss the impacts of local petroleum-based industries on the community, families and individuals; e.g., economic (social, industrial), environmental.
Students will investigate possible entry-level positions within the oil and gas industry.	**Oil and Gas Field Preparation** *Students will:* • identify specific site safety issues, regulations and procedures • identify equipment and machinery used in oil and gas exploration, drilling, extraction, transportation and processing; e.g., – drill rigs – well heads/blow-out preventers – pump jacks – separators – pipelines • identify positions and related duties in oil and gas: – exploration; e.g., jug hand, driller, site preparation – drilling; e.g., tool push, floor hand, derrick hand – extraction; e.g., operators, wire line crew – transportation; e.g., flag person, equipment operators (licence classification, hydraulics and heavy equipment) – processing; e.g., maintenance worker – clean-up; e.g., site reclamation.

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ENSURING QUALITY

General Outcomes	Specific Outcomes
Students will demonstrate an understanding of the value of effective task management processes by applying knowledge and skills to simulated and actual work situations.	**Task Management** **Outcomes** *Students will:* • read and/or listen to instructions • ask questions to clarify expected outcomes, procedures and time lines. **Decision Making** *Students will:* • identify the parameters of the task • generate and review alternative ideas and their consequences • make a decision or select an idea. **Planning** *Students will:* • identify the steps involved in managing a project • prepare a sample project plan, including budget and time line • identify available tools, equipment and materials. **Performance Standards** *Students will:* • identify expected standards for a product or service • work to agreed quality standards and specifications • select and use appropriate tools and technology for a task or project. **Evaluation** *Students will:* • identify opportunities for improving quality • establish expectations and measures for improvements • create evidence to support an understanding of task management and skill development for inclusion in a personal portfolio.

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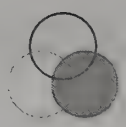

ACADEMIC COMPETENCIES: These are the minimum academic competencies that provide a foundation for further learning. The following outcomes are provided as a reminder to address these academic competencies within the occupational context and to reinforce cross-curricular connections.

COMMUNICATION

General Outcomes	Specific Outcomes
Students will demonstrate effective listening, speaking, reading and writing skills to prepare for employment.	**Listening, Speaking, Reading and Writing** *Students will:* • read, view and interpret occupation-related materials for a specific purpose; e.g., – read related health and safety documents – read terms of employment documents – follow written instructions specific to an occupational area • create text for a specific purpose that clearly communicates information; e.g., – write a résumé – write a job description – submit job application forms • communicate thoughts and ideas and listen to the thoughts and ideas of others to effectively complete a task; e.g., – follow oral instructions – give effective oral instructions when necessary.

THINKING

Students will research information, use creative thinking skills and use effective problem-solving strategies to solve problems.	**Problem Solving, Decision Making, Finding Information and Creative Thinking** *Students will:* • demonstrate an effective problem-solving model; e.g., – identify the need for a solution to a problem/issue – identify why information is needed; e.g., make decisions, inform, persuade • identify appropriate actions and select and apply information that meets their purposes and needs • evaluate the results in terms of expected outcomes and assess the impact of information on their purpose and audience.

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NUMERACY

General Outcomes	Specific Outcomes
Students will demonstrate mathematical operations to effectively solve problems in a meaningful context.	**Basic Operations, Patterns and Relationships, Shape and Space, and Statistics and Probability** *Students will:* • apply arithmetic operations, e.g., addition, subtraction, multiplication or division, to whole numbers and decimals and use number operations when creating and solving money problems • use calculators or computers to perform calculations involving large and small numbers when solving problems • apply concepts of rate, ratio, percentage and proportion • demonstrate a number sense for whole numbers 0 to 100 000 and explore proper fractions and decimals • estimate, measure and compare, using decimal numbers and standard units of measure, to solve problems in everyday contexts; e.g., mass, length, volume, time, perimeter, surface area • use metric and imperial units of measure.

INFORMATION TECHNOLOGY

Students will demonstrate the effective use of information technology to perform daily workplace operations.	**Computer Operations and Computer Applications** *Students will:* • model and assume personal responsibility for the ethical use of information technologies • demonstrate appropriate telephone operations within the workplace; e.g., answer telephone calls appropriately, locate numbers and make telephone calls • use computer operations to assist in the completion of daily workplace operations; e.g., – use basic keyboarding skills – store, organize and retrieve information correctly – locate and select information and ideas, using appropriate technology and information systems; e.g., Internet – access, send and retrieve e-mail and attachments • demonstrate procedures for connecting and using audio, video and digital equipment • demonstrate procedures for sending and receiving faxes and setting up a fax machine • demonstrate procedures for copying and printing documents.

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SCIENCE

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(Vision Statement, 1994)

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Science 20–30 (2007)

Science 14–24 (2003)

Alberta Education Web Site

The Science Vision Statement, and all the science programs of study, are available for viewing and downloading at http://www.education.gov.ab.ca/k_12/curriculum/bySubject/science/default.asp.

BIOLOGY 20–30

Provincial Implementation Schedule
Biology 20 September 2007
Biology 30 September 2008

Implementation prior to these dates is **not** approved.

PROGRAM RATIONALE AND PHILOSOPHY

Science programs provide opportunities for students to develop the knowledge, skills and attitudes they need to become productive and responsible members of society. The programs also allow students to explore interests and prepare for further education and careers. Students graduating from Alberta schools require the scientific and related technological knowledge and skills that will enable them to understand and interpret their world. They also need to develop attitudes that will motivate them to use their knowledge and skills in a responsible manner.

To become scientifically literate, students need to develop a knowledge of science and its relationship to technologies and society. They also need to develop the broad-based skills required to identify and analyze problems; to explore and test solutions; and to seek, interpret and evaluate information. To ensure relevance to students as well as to societal needs, a science program must present science in a meaningful context—providing opportunities for students to explore the process of science, its applications and implications, and to examine related technological problems and issues. By doing so, students become aware of the role of science in responding to social and cultural change and in meeting needs for a sustainable environment, economy and society.

Program Vision

The secondary science program is guided by the vision that all students, regardless of gender or cultural background, are given the opportunity to develop scientific literacy. The goal of scientific literacy is to develop in students the science-related knowledge, skills and attitudes that they need to solve problems and make decisions and, at the same time, to help students become lifelong learners who maintain their sense of wonder about the world around them.

Diverse learning experiences within the science program provide students with opportunities to explore, analyze and appreciate the interrelationships among science, technology, society and the environment and to develop understandings that will affect their personal lives, their careers and their futures.

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Goals

The following goals for Canadian science education, developed in the *Common Framework of Science Learning Outcomes K to 12: Pan-Canadian Protocol for Collaboration on School Curriculum* (1997), are addressed through the Alberta science program. Science education will:

- encourage students at all grade levels to develop a critical sense of wonder and curiosity about scientific and technological endeavours
- enable students to use science and technology to acquire new knowledge and solve problems so that they may improve the quality of their lives and the lives of others
- prepare students to critically address science-related societal, economic, ethical and environmental issues
- provide students with a foundation in science that creates opportunities for them to pursue progressively higher levels of study, prepares them for science-related occupations and engages them in science-related hobbies appropriate to their interests and abilities
- develop in students of varying aptitudes and interests a knowledge of the wide spectrum of careers related to science, technology and the environment.

Aboriginal Perspectives

Courses in the senior high school sciences incorporate Aboriginal perspectives in order to develop, in all students, an appreciation of the cultural diversity and achievements of First Nations, Métis and Inuit (FNMI) peoples. These courses are designed to:

- acknowledge the contributions of Aboriginal peoples to understandings of the natural world
- support relational thinking by integrating learning from various disciplines of science
- develop the concept of humankind's connectivity to the natural world and foster an appreciation for the importance of caring for the environment
- foster the development of positive attitudes by providing experiences that encourage all students to feel confident about their ability to succeed in science.

Information and Communication Technology (ICT)

Selected curriculum outcomes from Alberta Education's Information and Communication Technology (ICT) Program of Studies are infused throughout the 20-level and 30-level sciences so that students will develop a broad perspective on the nature of technology, learn how to use and apply a variety of technologies, and consider the impact of ICT on individuals and society. The infusion of ICT outcomes supports and reinforces the understandings and abilities that students are expected to develop within Foundation 3 (Science, Technology and Society) and Foundation 4 (Skills) of these courses. Effective, efficient and ethical application of ICT outcomes contributes to the program vision.

Infusion of ICT outcomes provides learning opportunities for students to:

- understand the nature of technology and apply terminology appropriately
- use equipment carefully and share limited ICT resources
- use technology in an ethical manner, including respecting the ownership of information and digital resources and citing electronic sources
- use technology safely, including applying ergonomic principles and appropriate safety procedures
- use the Internet safely, including protecting personal information and avoiding contact with strangers
- use technology appropriately, including following communication etiquette and respecting the privacy of others.

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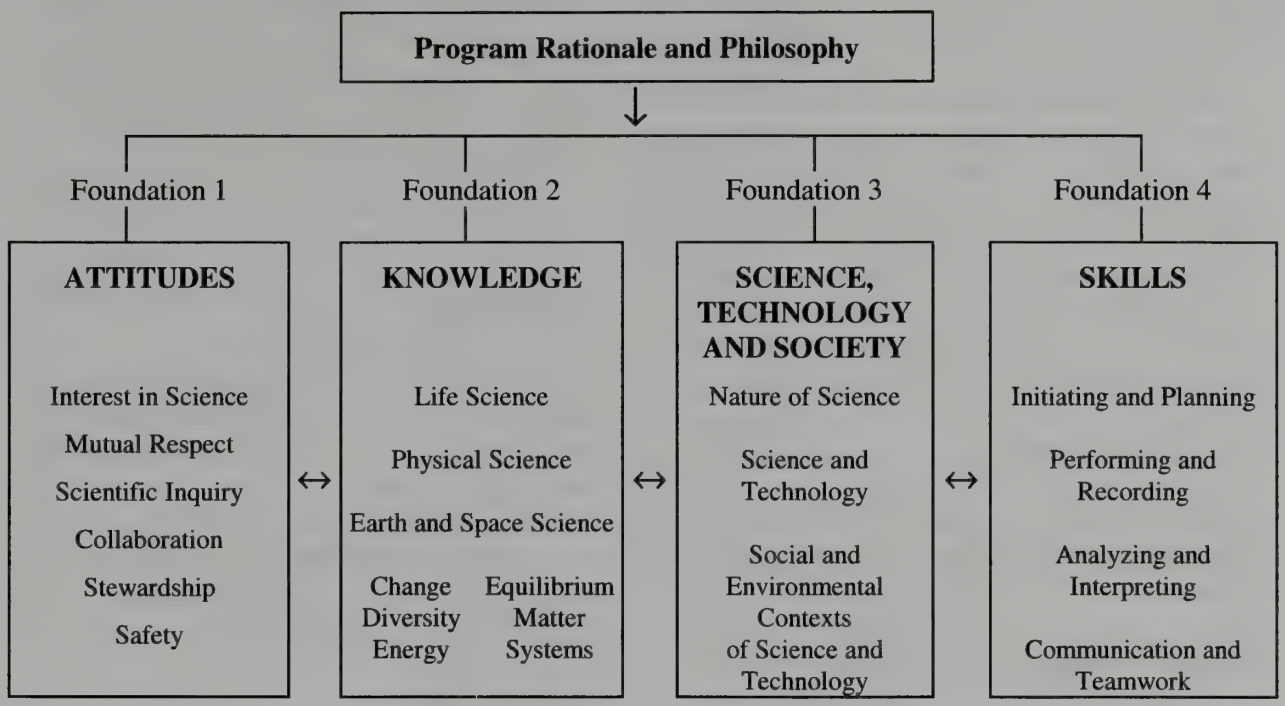
PROGRAM FOUNDATIONS

To support the development of scientific literacy, a science program must provide learning experiences that address critical aspects of science and its application. These foundations provide a general direction for the program and identify the major components of its structure.



Foundation 1
Attitudes—*Students will be encouraged to* develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society and the environment.

Foundation 2
Knowledge—*Students will* construct knowledge and understandings of concepts in life science, physical science and Earth and space science, and apply these understandings to interpret, integrate and extend their knowledge.

Foundation 3
Science, Technology and Society (STS)—*Students will* develop an understanding of the nature of science and technology, the relationships between science and technology, and the social and environmental contexts of science and technology.

Foundation 4
Skills—*Students will* develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively and for making informed decisions.

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Foundation 1: Attitudes

Foundation 1 is concerned with the generalized aspects of behaviour that are commonly referred to as attitudes. Attitude outcomes are of a different form than outcomes for skills and knowledge: they are exhibited in a different way, and they are rooted more deeply in the experiences that students bring to school. Attitude development is a lifelong process that involves the home, the school, the community and society at large. Attitudes are best shown not by the events of a particular moment but by the pattern of behaviours over time. Development of positive attitudes plays an important role in student growth by interacting with students' intellectual development and by creating a readiness for responsible application of what is learned.

Interest in Science

Students will be encouraged to develop enthusiasm and continuing interest in the study of science.

Mutual Respect

Students will be encouraged to appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds.

Scientific Inquiry

Students will be encouraged to develop attitudes that support active inquiry, problem solving and decision making.

Collaboration

Students will be encouraged to develop attitudes that support collaborative activity.

Stewardship

Students will be encouraged to develop responsibility in the application of science and technology in relation to society and the natural environment.

Safety

Students will be encouraged to demonstrate a concern for safety in science and technology contexts.

Foundation 2: Knowledge

Foundation 2 focuses on the subject matter of science, including the laws, theories, models, concepts and principles that are essential to an understanding of each science area. For organizational purposes, this foundation is framed using widely accepted science disciplines.

Life Science

Life science deals with the growth and interactions of life forms within their environments in ways that reflect their uniqueness, diversity, genetic continuity and changing nature. Life science includes such fields of study as ecosystems, biological diversity, organisms, cells, biochemistry, genetic engineering and biotechnology.

Physical Science

Physical science, which encompasses chemistry and physics, deals with matter, energy and forces. Matter has structure, and there are interactions among its components. Energy links matter to gravitational, electromagnetic and nuclear forces in the universe. Physical science also addresses the conservation laws of mass and energy, momentum and charge.

Earth and Space Science

Earth and space science brings global and universal perspectives to student knowledge. The planet Earth exhibits form, structure and patterns of change, as does the surrounding solar system and the physical universe beyond it. Earth and space science includes such fields of study as geology, meteorology and astronomy.

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Themes are the major ideas of science and technology that transcend discipline boundaries and demonstrate unity among the natural sciences. Six themes have been identified for the senior high school sciences program.

Change
Students will develop an understanding of:

How all natural entities are modified over time, how the direction of change might be predicted and, in some instances, how change can be controlled.

Diversity
Students will develop an understanding of:

The array of living and nonliving forms of matter and the procedures used to understand, classify and distinguish these forms of matter on the basis of recurring patterns.

Energy
Students will develop an understanding of:

The capacity for doing work that drives much of what takes place in the universe through its variety of interconvertible forms.

Equilibrium
Students will develop an understanding of:

The state in which opposing forces or processes balance in a static or dynamic way.

Matter
Students will develop an understanding of:

The constituent parts, and the variety of states, of the material in the physical world.

Systems
Students will develop an understanding of:

The interrelated groups of things or events that can be defined by their boundaries and, in some instances, by their inputs and outputs.

Foundation 3: Science, Technology and Society (STS)

Foundation 3 is concerned with understanding the scope and character of science, its connections to technology and the social context in which it is developed. The following is a brief introduction to the major ideas underlying this component of the program.

Nature of Science

Science provides an ordered way of learning about the nature of things, based on observation and evidence. Through science, we explore our environment, gather knowledge and develop ideas that help us interpret and explain what we see. Scientific activity provides a conceptual and theoretical base that is used in predicting, interpreting and explaining natural and technological phenomena. Science is driven by a combination of specific knowledge, theory, observation and experimentation. Science-based ideas are continually being tested, modified and improved as new knowledge and explanations supersede existing knowledge and explanations.

Science and Technology

Technology is concerned with solving practical problems that arise from human needs. Historically, the development of technology has been strongly linked to the development of science, with each making contributions to the other. While there are important relationships and interdependencies, there are also important differences. Whereas the focus of science is on the development and verification of knowledge, the focus of technology is on the development of solutions, involving devices and systems that meet a given need within the constraints of a problem. The test of scientific knowledge is that it helps us explain, interpret and predict; the test of technology is that it works—it enables us to achieve a given purpose.

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Social and Environmental Contexts

The history of science shows that scientific development takes place within a social context. Many examples can be used to show that cultural and intellectual traditions have influenced the focus and methodologies of science, and that science in turn has influenced the wider world of ideas.

Today, research is often driven by societal and environmental needs and issues. As technological solutions have emerged from previous research, many of the new technologies have given rise to complex social and environmental issues. Increasingly, these issues are becoming part of the political agenda. The potential of science to inform and empower decision making by individuals, communities and society is central to scientific literacy in a democratic society.

Foundation 4: Skills

Foundation 4 is concerned with the skills that students develop in answering questions, solving problems and making decisions. While these skills are not unique to science, they play an important role in the development of scientific understandings and in the application of science and technology to new situations. Four broad skill areas are outlined in the secondary science program. Each skill area is developed at each level with increasing scope and complexity of application.

Initiating and Planning

These are the skills of questioning, identifying problems and developing preliminary ideas and plans.

Performing and Recording

These are the skills of carrying out a plan of action that include gathering evidence by observation and, in most cases, manipulating materials and equipment.

Analyzing and Interpreting

These are the skills of examining information and evidence; of processing and presenting data so that they can be interpreted; and of interpreting, evaluating and applying the results.

Communication and Teamwork

In science, as in other areas, communication skills are essential at every stage during which ideas are being developed, tested, interpreted, debated and agreed upon. Teamwork skills are also important, as the development and application of science ideas are collaborative processes both in society and in the classroom.

PROGRAM ORGANIZATION

Attitude Outcomes

A listing of Attitude outcomes is included at the beginning of each of the 20-level and 30-level courses in the senior high school sciences program. These specific outcomes are to be developed throughout the particular course in conjunction with the specific outcomes for Knowledge, STS and Skills listed within each unit of study.

Units of Study

In the senior high school sciences program, four units of study are outlined for each course. Each unit in the 20-level and 30-level courses includes the following components.

Themes

Themes are the major ideas of science that transcend topics of study.

Overview

The overview introduces the contents of the unit and suggests an approach to unit development.

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Links to Mathematics

This section lists topics from mathematics programs of study that are related to the science content of the unit.

Focusing Questions

These questions frame a context for introducing the unit and suggest a focus for investigative activities and application of ideas by students.

Key Concepts

Key concepts identify major ideas to be developed in the unit. Some of the concepts may be addressed in additional units of the same course, as well as in other courses. The intended scope of treatment of these concepts is indicated by the outcomes.

Outcomes

Two levels of outcomes are provided in each unit:

- General Outcomes: These are the major outcomes in the unit that students are to demonstrate over the course of their learning.
- Specific Outcomes: These are detailed outcomes that delineate the scope of each general outcome and the unit. Specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills are identified.

The outcomes are numbered for the purpose of referencing. This numbering is not intended to imply a fixed instructional sequence.

Examples

Many of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

STS Emphases

The specific outcomes for Science, Technology and Society (STS) and Skills for each general outcome in a unit include one of the following emphases:

- Nature of Science
- Science and Technology
- Social and Environmental Contexts

The STS emphases provide opportunities for students to develop related concepts and skills as outlined on pages 8 to 10.

Additional Links

Links to the STS emphasis frameworks (pages 8 to 10) are shown in **boldface** and (in parentheses) after specific outcomes for STS and after specific outcomes or examples for Skills. Links to the Division 4 ICT curriculum (pages 11 to 13) are shown in **boldface** and [in brackets] after some of the specific outcomes and examples for STS and Skills. The STS and ICT links indicate that the concept or skill from the STS emphasis framework or the Division 4 ICT outcome has been addressed in the specific outcome or example.

Note: The listing of STS and ICT links is not exhaustive; other links may exist.

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Framework for Developing a Nature of Science Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on how scientific knowledge is developed)

Students will develop an understanding that:

- the goal of science is knowledge about the natural world **(NS1)**
- scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**
- scientific knowledge results from peer review and replication of the research of others **(NS3)**
- scientific knowledge is subject to change as new evidence becomes apparent and as laws and theories are tested and subsequently revised, reinforced or rejected **(NS4)**
- the process of scientific investigation includes **(NS5)**:
  - identifying the theoretical basis of the investigation **(NS5a)**
  - defining and delimiting, clearly, research questions or ideas to be tested **(NS5b)**
  - designing the investigation **(NS5c)**
  - evaluating and selecting means to collect and record evidence **(NS5d)**
  - carrying out the investigation **(NS5e)**
  - analyzing the evidence and providing explanations based upon scientific theories and concepts **(NS5f)**
- scientific paradigms are conceptual inventions that help organize, interpret and explain findings **(NS6)**
  - Concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**
  - Conventions of mathematics, nomenclature and notation provide a basis for organizing and communicating scientific theory, relationships and concepts; e.g., chemical symbols **(NS6b)**
  - Scientific language is precise, and specific terms may be used in each field of study **(NS6c)**
- scientific inquiry is limited to certain questions **(NS7)**

Skills (focus on scientific inquiry)

Initiating and Planning **(IP–NS)**

Students will:

- identify, define and delimit questions to investigate **(IP–NS1)**
- design an experiment, identifying and controlling major variables **(IP–NS2)**
- state a prediction and a hypothesis based on available evidence or background information or on a theory **(IP–NS3)**
- evaluate and select appropriate procedures, including appropriate sampling procedures, and instruments for collecting evidence and information **(IP–NS4)**

Performing and Recording **(PR–NS)**

Students will:

- research, integrate and synthesize information from various print and electronic sources regarding a scientific question **(PR–NS1)**
- select and use appropriate instruments for collecting data effectively, safely and accurately **(PR–NS2)**
- carry out procedures, controlling the major variables, and adapt or extend procedures where required **(PR–NS3)**
- compile and organize findings and data by hand or computer, using appropriate formats such as diagrams, flowcharts, tables and graphs **(PR–NS4)**
- apply Workplace Hazardous Materials Information System (WHMIS) standards to handle and dispose of materials **(PR–NS5)**

Analyzing and Interpreting **(AI–NS)**

Students will:

- apply appropriate terminology, classification systems and nomenclature used in the sciences **(AI–NS1)**
- interpret patterns and trends in data and predict the value of a variable by interpolating or extrapolating from graphical data or from a line of best fit **(AI–NS2)**
- estimate and calculate the value of variables, compare theoretical and empirical values, and account for discrepancies **(AI–NS3)**
- identify limitations of data or measurements; explain sources of error; and evaluate the relevance, reliability and adequacy of data and data collection methods **(AI–NS4)**
- identify new questions or problems that arise from what was learned **(AI–NS5)**
- state a conclusion, based on data obtained from investigations, and explain how evidence gathered supports or refutes a hypothesis, prediction or theory **(AI–NS6)**

Communication and Teamwork **(CT–NS)**

Students will:

- work collaboratively to develop and carry out investigations **(CT–NS1)**
- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**
- evaluate individual and group processes used in planning and carrying out investigative tasks **(CT–NS3)**

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Framework for Developing a Science and Technology Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on the interrelationship of science and technology)

Students will develop an understanding that:

- the goal of technology is to provide solutions to practical problems **(ST1)**
- technological development may involve the creation of prototypes, the testing of prototypes and the application of knowledge from related scientific and interdisciplinary fields **(ST2)**
- technological problems often require multiple solutions that involve different designs, materials and processes and that have both intended and unintended consequences **(ST3)**
- scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4)**
- the process for technological development includes **(ST5)**:
  - defining and delimiting, clearly, the problems to be solved and establishing criteria to assess the technological solution **(ST5a)**
  - identifying the constraints, the benefits and the drawbacks **(ST5b)**
  - developing designs and prototypes **(ST5c)**
  - testing and evaluating designs and prototypes on the basis of established criteria **(ST5d)**
- the products of technology are devices, systems and processes that meet given needs; however, these products cannot solve all problems **(ST6)**
- the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7)**

Skills (focus on problem solving)

Initiating and Planning **(IP–ST)**
Students will:

- identify questions to investigate arising from practical problems **(IP–ST1)**
- propose and assess alternative solutions to a given practical problem, select one and develop a plan **(IP–ST2)**
- evaluate and select appropriate procedures and instruments for collecting data and information and for solving problems **(IP–ST3)**

Performing and Recording **(PR–ST)**
Students will:

- research, integrate and synthesize information from various print and electronic sources relevant to a practical problem **(PR–ST1)**
- construct and test a prototype device or system and troubleshoot problems as they arise **(PR–ST2)**
- select and use tools, apparatus and materials safely **(PR–ST3)**

Analyzing and Interpreting **(AI–ST)**
Students will:

- evaluate designs and prototypes on the basis of self-developed criteria; e.g., function, reliability, cost, safety, efficient use of materials, impact on the environment **(AI–ST1)**
- analyze alternative solutions to a given problem, identify potential strengths and weaknesses of each and recommend an approach to solving the problem, based on findings **(AI–ST2)**
- solve problems by selecting appropriate technology to perform manipulations and calculations **(AI–ST3)**
- identify new questions and problems that arise from what was learned and evaluate potential applications of findings **(AI–ST4)**

Communication and Teamwork **(CT–ST)**
Students will:

- work collaboratively to test a prototype device or system and troubleshoot problems as they arise **(CT–ST1)**
- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–ST2)**
- evaluate individual and group processes used in planning and carrying out problem-solving tasks **(CT–ST3)**

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Framework for Developing a Social and Environmental Contexts Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on issues related to the application of science and technology)

Students will develop an understanding that:

- science and technology are developed to meet societal needs and expand human capability **(SEC1)**
- science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2)**
- science and technology have both intended and unintended consequences for humans and the environment **(SEC3)**
- society provides direction for scientific and technological development **(SEC4)**
  - Canadian society supports scientific research and technological development to facilitate a sustainable society, economy and environment **(SEC4a)**
  - Decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b)**
  - Society supports scientific and technological development by recognizing accomplishments, publishing and disseminating results and providing financial support **(SEC4c)**
- scientific and technological activity may arise from, and give rise to, such personal and social values as accuracy, honesty, perseverance, tolerance, open-mindedness, critical-mindedness, creativity and curiosity **(SEC5)**
- science and technology provide opportunities for a diversity of careers based on post-secondary studies, for the pursuit of hobbies and interests, and for lifelong learning **(SEC6)**

Skills (focus on applying science to inform decision-making processes)

Initiating and Planning **(IP–SEC)**
Students will:

- identify questions to investigate that arise from issues related to the application of science and technology **(IP–SEC1)**
- plan complex searches for information, using a wide variety of electronic and print sources **(IP–SEC2)**
- assess and develop appropriate processes for collecting relevant data and information about science-and-technology-related issues **(IP–SEC3)**

Performing and Recording **(PR–SEC)**
Students will:

- research, integrate and synthesize information from various print and electronic sources relevant to a given question, problem or issue **(PR–SEC1)**
- select information and gather evidence from appropriate sources and evaluate search strategies **(PR–SEC2)**

Analyzing and Interpreting **(AI–SEC)**
Students will:

- apply given criteria for evaluating evidence and assess the authority, reliability, scientific accuracy and validity of sources of information **(AI–SEC1)**
- apply a variety of perspectives in assessing the risks and benefits of scientific and technological developments **(AI–SEC2)**
- assess potential decisions and recommend the best one, based on findings **(AI–SEC3)**
- identify new questions that arise and evaluate, from a variety of perspectives, potential implications of findings **(AI–SEC4)**

Communication and Teamwork **(CT–SEC)**
Students will:

- work collaboratively to investigate a science-and-technology-related issue **(CT–SEC1)**
- communicate in a persuasive and an engaging manner, using appropriate multimedia forms, to further understand a complex science-and-technology-related issue **(CT–SEC2)**
- make clear and logical arguments to defend a given decision on an issue, based on findings **(CT–SEC3)**
- evaluate individual and group processes used in investigating an issue and in evaluating alternative decisions **(CT–SEC4)**

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Division 4 ICT Outcomes

Category: Communicating, Inquiring, Decision Making and Problem Solving

General Outcomes	Specific Outcomes
C1 **Students will access, use and communicate information from a variety of technologies.**	C1 4.1 plan and perform complex searches, using more than one electronic source 4.2 select information from appropriate sources, including primary and secondary sources 4.3 evaluate and explain the advantages and disadvantages of various search strategies 4.4 communicate in a persuasive and engaging manner, through appropriate forms, such as speeches, letters, reports and multimedia presentations, applying information technologies for context, audience and purpose that extend and communicate understanding of complex issues
C2 **Students will seek alternative viewpoints, using information technologies.**	C2 4.1 consult a wide variety of sources that reflect varied viewpoints on particular topics 4.2 evaluate the validity of gathered viewpoints against other sources
C3 **Students will critically assess information accessed through the use of a variety of technologies.**	C3 4.1 assess the authority, reliability and validity of electronically accessed information 4.2 demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic
C4 **Students will use organizational processes and tools to manage inquiry.**	C4 4.1 use calendars, time management or project management software to assist in conducting an inquiry
C5 **Students will use technology to aid collaboration during inquiry.**	C5 4.1 use telecommunications to pose critical questions to experts 4.2 participate in a variety of electronic group formats
C6 **Students will use technology to investigate and/or solve problems.**	C6 4.1 investigate and solve problems of prediction, calculation and inference 4.2 investigate and solve problems of organization and manipulation of information 4.3 manipulate data by using charting and graphing technologies in order to test inferences and probabilities 4.4 generate new understandings of problematic situations by using some form of technology to facilitate the process 4.5 evaluate the appropriateness of the technology used to investigate or solve a problem
C7 **Students will use electronic research techniques to construct personal knowledge and meaning.**	C7 4.1 use appropriate strategies to locate information to meet personal needs 4.2 analyze and synthesize information to determine patterns and links among ideas 4.3 use appropriate presentation software to demonstrate personal understandings

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Division 4 ICT Outcomes (continued)

Category: Foundational Operations, Knowledge and Concepts

General Outcomes	Specific Outcomes
F1 **Students will demonstrate an understanding of the nature of technology.**	**F1** 4.1 assess the strengths and weaknesses of computer simulations in relation to real-world problems 4.2 solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments 4.3 apply terminology appropriate to technology in all forms of communication 4.4 demonstrate an understanding of the general concepts of computer programming and the algorithms that enable technological devices to perform operations and solve problems
F2 **Students will understand the role of technology as it applies to self, work and society.**	**F2** 4.1 use technology outside formal classroom settings 4.2 analyze how technological innovations and creativity affect the economy 4.3 demonstrate an understanding of new and emerging communication systems 4.4 evaluate possible potential for emerging technologies 4.5 demonstrate conservation measures when using technology 4.6 demonstrate an understanding of the basic principles and issues of e-commerce, including such topics as security and privacy, marketing, and implications for governments, businesses and consumers alike 4.7 use current, reliable information sources from around the world 4.8 analyze and assess the impact of technology on the global community
F3 **Students will demonstrate a moral and ethical approach to the use of technology.**	**F3** 4.1 demonstrate an understanding of how changes in technology can benefit or harm society 4.2 record relevant data for acknowledging sources of information, and cite sources correctly 4.3 respect ownership and integrity of information
F4 **Students will become discerning consumers of mass media and electronic information.**	**F4** 4.1 discriminate between style and content in a presentation 4.2 evaluate the influence and results of digital manipulation on our perceptions 4.3 identify and analyze a variety of factors that affect the authenticity of information derived from mass media and electronic communication
F5 **Students will practise the concepts of ergonomics and safety when using technology.**	**F5** 4.1 assess new physical environments with respect to ergonomics 4.2 identify safety regulations specific to the technology being used
F6 **Students will demonstrate a basic understanding of the operating skills required in a variety of technologies.**	**F6** 4.1 continue to demonstrate the outcomes addressed within the previous divisions. Students interested in pursuing advanced study in such areas as electronics, programming, computer-aided design and drafting (CADD), robotics and other industrial applications of technology will find opportunities in Career and Technology Studies (CTS) courses

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Division 4 ICT Outcomes (continued)

Category: Processes for Productivity

General Outcomes	Specific Outcomes
P1 **Students will compose, revise and edit text.**	P1 4.1 continue to demonstrate the outcomes achieved in prior grades and course subjects
P2 **Students will organize and manipulate data.**	P2 4.1 manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets
P3 **Students will communicate through multimedia.**	P3 4.1 select and use, independently, multimedia capabilities for presentations in various subject areas 4.2 support communication with appropriate images, sounds and music 4.3 apply general principles of graphic layout and design to a document in process
P4 **Students will integrate various applications.**	P4 4.1 integrate a variety of visual and audio information into a document to create a message targeted for a specific audience 4.2 apply principles of graphic design to enhance meaning and audience appeal 4.3 use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text
P5 **Students will navigate and create hyperlinked resources.**	P5 4.1 create multiple-link documents appropriate to the content of a particular topic 4.2 post multiple-link pages on the World Wide Web or on a local or wide area network
P6 **Students will use communication technology to interact with others.**	P6 4.1 select and use the appropriate technologies to communicate effectively with a targeted audience

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BIOLOGY 20

Biology 20 consists of four units of study:

A. Energy and Matter Exchange in the Biosphere
B. Ecosystems and Population Change
C. Photosynthesis and Cellular Respiration
D. Human Systems

Attitude Outcomes

Students will be encouraged to develop positive attitudes that support the responsible acquisition and application of knowledge related to science and technology. The following attitude outcomes are to be developed throughout Biology 20, in conjunction with the specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills in each unit.

Interest in Science

Students will be encouraged to:
show interest in science-related questions and issues and confidently pursue personal interests and career possibilities within science-related fields; *e.g.,*

- *research the answers to questions they generate*
- *explore and use a variety of methods and resources to increase their knowledge and skills*
- *be critical and constructive when considering new theories and techniques*
- *use scientific vocabulary and principles in everyday discussions*
- *recognize the usefulness of being skilled in mathematics and problem solving*
- *be interested in science and technology topics not directly related to their formal studies*
- *recognize the importance of making connections among various science disciplines*
- *maintain interest in pursuing further studies in science*
- *explore where further science- and technology-related studies and careers can be pursued*
- *recognize that many careers require science- and technology-related knowledge and skills.*

Mutual Respect

Students will be encouraged to:
appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds; *e.g.,*

- *use a multiperspective approach, considering scientific, technological, economic, cultural, political and environmental factors when formulating conclusions, solving problems or making decisions on an STS issue*
- *research carefully and discuss openly ethical dilemmas associated with the applications of science and technology*
- *explore personal perspectives, attitudes and beliefs toward scientific and technological advancements*
- *recognize the contribution of science and technology to the progress of civilizations*
- *show support for the development of technologies and science as they relate to human needs*
- *recognize that the scientific approach is one of many ways of viewing the universe*
- *recognize the research contributions of both men and women*
- *recognize the research contributions of Canadians.*

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Scientific Inquiry

Students will be encouraged to:
seek and apply evidence when evaluating alternative approaches to investigations, problems and issues; *e.g.,*

- *consider the social and cultural contexts in which a theory developed*
- *appreciate how scientific problem solving and the development of new technologies are related*
- *insist on evidence before accepting a new idea or a new explanation*
- *assess, critically, their opinion of the value of science and its applications*
- *question arguments in which evidence, explanations or positions do not reflect the diversity of perspectives that exist*
- *criticize arguments that are based on faulty, incomplete or misleading use of numbers*
- *recognize the importance of reviewing the basic assumptions from which a line of inquiry has arisen*
- *insist that the critical assumptions behind any line of reasoning be made explicit so that the validity of the position taken can be judged*
- *evaluate inferences and conclusions, being cognizant of the many variables involved in experimentation*
- *ask questions and conduct research to ensure understanding*
- *expend the effort and time needed to make valid inferences*
- *seek new models, explanations and theories when confronted with discrepant events.*

Collaboration

Students will be encouraged to:
work collaboratively in planning and carrying out investigations and in generating and evaluating ideas; *e.g.,*

- *provide the same attention and energy to the group's product as they would to a personal assignment*
- *be attentive when others speak, seek the point of view of others, and consider a multitude of perspectives*
- *use appropriate communication technology to elicit feedback from others*
- *participate in a variety of electronic group formats.*

Stewardship

Students will be encouraged to:
demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment; *e.g.,*

- *assume part of the collective responsibility for the impact of humans on the environment*
- *participate in civic activities related to the preservation and judicious use of the environment and its resources*
- *encourage their peers or members of their community to participate in a project related to sustainability*
- *consider all perspectives when addressing issues, weighing scientific, technological and ecological factors*
- *discuss both the positive and negative effects on human beings and society of environmental changes caused by nature and by humans*
- *participate in the social and political systems that influence environmental policy in their community*
- *promote actions that are not injurious to the environment*

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- *make personal decisions based on a feeling of responsibility toward less privileged parts of the global community and toward future generations*
- *be critical-minded regarding the short- and long-term consequences of sustainability.*

Safety

Students will be encouraged to:
show concern for safety in planning, carrying out and reviewing activities, referring to the Workplace Hazardous Materials Information System (WHMIS) and consumer product labelling information; *e.g.,*

- *consider safety a positive limiting factor in scientific and technological endeavours*
- *read the labels on materials before using them, interpret the WHMIS symbols and consult a reference document if safety symbols are not understood*
- *manipulate materials carefully, being cognizant of the risks and consequences of their actions*
- *assume responsibility for the safety of all those who share a common working environment by cleaning up after an activity and disposing of materials according to safety guidelines*
- *seek assistance immediately for any first-aid concerns, such as cuts, burns or unusual reactions*
- *keep the work station uncluttered, ensuring that only appropriate laboratory materials are present*
- *criticize a procedure, a design or a particular use of materials that is not safe or that could have a negative impact on the environment*
- *use safety and waste disposal as criteria for evaluating an experiment*
- *write safety and waste-disposal precautions into a laboratory procedure.*

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Unit A: Energy and Matter Exchange in the Biosphere

Themes: Energy, Equilibrium, Matter and Systems

Overview: The constant flow of energy and cycling of matter in the biosphere leads to a balanced or steady state. This balance is achieved through various biogeochemical cycles and the processes of photosynthesis and cellular respiration.

In this unit, students become familiar with the maintenance of this balance and explore how various human activities have affected the balance.

This unit builds on:

- Grade 7 Science, Unit A: Interactions and Ecosystems
- Grade 9 Science, Unit A: Biological Diversity
- Science 10, Unit D: Energy Flow in Global Systems

Unit A will require approximately 20% of the time allotted for Biology 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit A but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• graphing and interpreting nonlinear data	Pure Mathematics 10, specific outcome 3.1; Applied Mathematics 10, specific outcome 3.1
• measurement	Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: How are carbon, oxygen, nitrogen and phosphorus cycled in the biosphere? How is the flow of energy balanced in the biosphere? How have human activities and technological advances affected the balance of energy and matter in the biosphere?

General Outcomes: There are three major outcomes in this unit.

Students will:

1. explain the constant flow of energy through the biosphere and ecosystems
2. explain the cycling of matter through the biosphere
3. explain the balance of energy and matter exchange in the biosphere, as an open system, and explain how this maintains equilibrium.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- biosphere
- equilibrium
- trophic levels
- food chains, food webs and ecological pyramids (energy, biomass and numbers)
- carbon, nitrogen, oxygen and phosphorus cycles
- water properties

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General Outcome 1
Students will explain the constant flow of energy through the biosphere and ecosystems.

Specific Outcomes for Knowledge

Students will:

20–A1.1k explain, in general terms, the one-way flow of energy through the biosphere and how stored energy in the biosphere, as a system, is eventually "lost" as heat; *e.g.,*
- *photosynthesis/chemosynthesis*
- *cellular respiration (muscle-heat generation, decomposition)*
- *energy transfer by conduction, radiation and convection*

20–A1.2k explain how energy in the biosphere can be perceived as a balance between both photosynthetic and chemosynthetic activities and cellular respiratory activities; i.e.,
- energy flow in photosynthetic environments
- energy flow in deep sea vent (chemosynthetic) ecosystems and other extreme environments

20–A1.3k explain the structure of ecosystem trophic levels, using models such as food chains and food webs

20–A1.4k explain, quantitatively, the flow of energy and the exchange of matter in aquatic and terrestrial ecosystems, using models such as pyramids of numbers, biomass and energy.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–A1.1sts explain that the process of scientific investigation includes analyzing evidence and providing explanations based upon scientific theories and concepts **(NS5f) [ICT C6–4.2]**
- *evaluate the evidence for the influence of ice and snow on the trapping of solar energy (albedo effect) and hypothesize on the consequences of fluctuations for biological systems*
- *explain how metabolic heat release from harvested grain can be reduced by drying processes prior to grain storage and explain the scientific principles involved in this technology*
- *explain, in terms of energy flow, the advantage of vegetarianism in densely populated countries.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain the constant flow of energy through the biosphere and ecosystems.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–A1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *propose a relationship between producers and available energy of a system* **(IP–SEC1)**
- *predict a relationship between solar energy storage by plants and varying light conditions* **(IP–NS3) [ICT C6–4.1]**.

Performing and Recording

Students will:

20–A1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment to demonstrate solar energy storage by plants **(PR–NS3, PR–NS4, PR–NS5)**
- *draw, by hand or using technology, annotated diagrams of food chains, food webs and ecological pyramids* **(PR–NS4)**.

Analyzing and Interpreting

Students will:

20–A1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze data on the diversity of plants, animals and decomposers of an endangered ecosystem, *e.g., wetlands, short grass prairie*, and predict long-term outcomes **(AI–SEC1) [ICT C6–4.1]**
- compare alternative ways of presenting energy flow data for ecosystems; i.e., pyramids of energy, biomass and numbers **(AI–SEC1, AI–NS4, AI–NS6) [ICT C6–4.2]**
- *analyze data on the storage of solar energy by plants* **(AI–NS2, AI–NS3, AI–NS4, AI–NS6)**.

Communication and Teamwork

Students will:

20–A1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate International System of Units (SI) notation, fundamental and derived units and significant digits **(CT–NS2)**★
- use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate ideas, plans and results **(CT–NS2)**★
- *use appropriate notation units in the data presented in an energy pyramid* **(CT–NS2)**
- *work cooperatively as a team to investigate, synthesize and present information on the effect of organism diversity on an ecosystem* **(CT–SEC1, CT–SEC2, CT–SEC3) [ICT C1–4.4, C7–4.2]**.

★To be developed throughout the course.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the cycling of matter through the biosphere.

Specific Outcomes for Knowledge

Students will:

20–A2.1k explain and summarize the biogeochemical cycling of carbon, oxygen, nitrogen and phosphorus and relate this to general reuse of all matter in the biosphere

20–A2.2k explain water's primary role in the biogeochemical cycles, considering its chemical and physical properties; i.e., universal solvent, hydrogen bonding.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

20–A2.1sts explain that science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F3–4.1]**

- *discuss the influence of human activities on the biogeochemical cycling of phosphorus, sulfur, iron and nitrogen:*
  - *feedlot operations*
  - *composting*
  - *fertilizer applications*
  - *waste and sewage disposal*
  - *vehicle and refinery emissions*
  - *acid deposition*
  - *persistent organic pollutants*
- *discuss the use of water by society, the impact such use has on water quality and quantity in ecosystems, and the need for water purification and conservation:*
  - *manufacturing and processing*
  - *petrochemical industry*
  - *agricultural systems*
  - *mining industry*
  - *domestic daily water consumption*
- *analyze the relationship between heavy metals released into the environment and matter exchange in natural food chains/webs and analyze the impact of this relationship on quality of life.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the cycling of matter through the biosphere.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–A2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment to compare the carbon dioxide production of plants with that of animals **(IP–NS1, IP–NS2, IP–NS3, IP–NS4)**
- hypothesize how alterations in the carbon cycle, resulting from the burning of fossil fuels, might affect other cycling phenomena; *e.g., sulfur, iron, water* **(IP–NS3) [ICT C6–4.1]**
- predict disruptions in the nitrogen and phosphorus cycles that are caused by human activities **(IP–NS3) [ICT C6–4.1]**.

Performing and Recording

Students will:

20–A2.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- measure and record the pH and the amount of nitrates, phosphates, iron or sulfites in water samples **(PR–NS2, PR–NS3, PR–NS4) [ICT P2–4.1]**.

Analyzing and Interpreting

Students will:

20–A2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze data collected on water consumption and loss in plants and animals **(AI–NS2, AI–NS3, AI–NS4) [ICT C7–4.2]**.

Communication and Teamwork

Students will:

20–A2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively in a group to investigate the influence of human activities on the biogeochemical cycles and use appropriate multimedia to present the information to a group* **(CT–SEC1, CT–SEC2, CT–SEC3) [ICT C1–4.2, F2–4.7, P3–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain the balance of energy and matter exchange in the biosphere, as an open system, and explain how this maintains equilibrium.

Specific Outcomes for Knowledge

Students will:

20–A3.1k explain the interrelationship of energy, matter and ecosystem productivity (biomass production); *e.g.,*

- *Antarctic Ocean versus tropical seas*
- *tropical rain forest versus desert*
- *taiga versus tundra*
- *intertidal zone versus deep-sea benthos*
- *Arctic versus Antarctic*

20–A3.2k explain how the equilibrium between gas exchanges in photosynthesis and cellular respiration influences atmospheric composition

20–A3.3k describe the geologic evidence (stromatolites) and scientific explanations for change in atmospheric composition, with respect to oxygen and carbon dioxide, from anoxic conditions to the present, and describe the significance to current biosphere equilibrium.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

20–A3.1sts explain that science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.4, F2–4.8]**

- *evaluate the technology of a closed system in terms of energy and matter:*
  - *space stations and spaceships*
  - *Biosphere experiments*
  - *manned exploration of Mars' surface*

20–A3.2sts explain that science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F3–4.1]**

- *describe how human activities can have a disrupting influence on the balance in the biosphere of photosynthetic and cellular respiratory activities:*
  - *fossil fuel combustion*
  - *depletion of stratospheric ozone*
  - *forest destruction.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain the balance of energy and matter exchange in the biosphere, as an open system, and explain how this maintains equilibrium.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

20–A3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- predict the effects of changes in carbon dioxide and oxygen concentration on the atmospheric equilibrium due to a significant reduction of photosynthetic organisms through human activity **(IP–NS3) [ICT C6–4.1]**.

Performing and Recording

Students will:

20–A3.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- *collect evidence from various print and electronic sources on how human activities can have a disrupting influence on photosynthetic and cellular respiratory activities* **(PR–SEC1, PR–SEC2) [ICT C1–4.1]**.

Analyzing and Interpreting

Students will:

20–A3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- design and evaluate a model of a closed biological system in equilibrium with respect to carbon dioxide, water and oxygen exchange **(PR–ST2, AI–ST1)**
- *compare and contrast the flow of energy and the cycling of matter in Biosphere 2 with that in Earth's biosphere* **(AI–SEC2)**.

Communication and Teamwork

Students will:

20–A3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively as a group to investigate, synthesize and present information on the effects of changes to stratospheric ozone levels on society, agriculture, plants and animals* **(CT–SEC1, CT–SEC2, CT–SEC3) [ICT C1–4.4, C7–4.2, F2–4.7]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit B: Ecosystems and Population Change

Themes: Energy, Matter and Systems

Overview: In this unit, students become familiar with a range of ecosystems by studying their distinctive biotic and abiotic characteristics. Students are introduced to the concept of populations as a basic component of ecosystem structure and complete the unit by examining population change through the process of natural selection.

The content in Unit B prepares students for the study of populations and community dynamics in Biology 30.

This unit builds on:

- Grade 7 Science, Unit A: Interactions and Ecosystems
- Grade 8 Science, Unit E: Freshwater and Saltwater Systems
- Grade 9 Science, Unit A: Biological Diversity

Unit B will require approximately 25% of the time allotted for Biology 20.

Links to Mathematics: None

Focusing Questions: What are the major biotic and abiotic characteristics that distinguish aquatic and terrestrial ecosystems? What data would one need to collect in a field study to illustrate the major abiotic characteristics and diversity of organisms? What mechanisms are involved in the change of populations over time? In what ways do humans apply their knowledge of ecosystems to assess and limit the impact of human activities?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explain that the biosphere is composed of ecosystems, each with distinctive biotic and abiotic characteristics
2. explain the mechanisms involved in the change of populations over time.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- ecosystem
- niche
- biotic/abiotic characteristics
- limiting factors
- binomial nomenclature
- adaptation and variation
- population
- natural selection
- species
- evidence for evolution

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General Outcome 1
Students will explain that the biosphere is composed of ecosystems, each with distinctive biotic and abiotic characteristics.

Specific Outcomes for Knowledge

Students will:

20–B1.1k define species, population, community and ecosystem and explain the interrelationships among them

20–B1.2k explain how terrestrial and aquatic ecosystems support a diversity of organisms through a variety of habitats and niches; *e.g.,*
- *terrestrial: canopy, sub-canopy, forest floor, soil*
- *aquatic: littoral, limnetic, profundal and benthic zones*

20–B1.3k identify biotic and abiotic characteristics and explain their influence in an aquatic and a terrestrial ecosystem in the local region; *e.g., stream, lake, prairie, boreal forest, vacant lot, sports field*

20–B1.4k explain how limiting factors influence organism distribution and range; *e.g.,*
- *abiotic factors: soil, relative humidity, moisture, ambient temperature, sunlight, nutrients, oxygen*
- *biotic factors: competitors, predators and parasites*

20–B1.5k explain the fundamental principles of taxonomy and binomial nomenclature, using modes of nutrition at the kingdom level and morphological characteristics at the genus species level.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

20–B1.1sts explain how science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F3–4.1]**
- *evaluate the impact that human activity has had, or could have, on the biodiversity in an ecosystem:*
  - *wetlands management*
  - *land use*
  - *interbasin water transfer*
  - *habitat fragmentation*
  - *urbanization*
  - *slash-and-burn and clearcutting practices*
  - *monoculturing of forests, lawns, field crops*
- *assess the environmental consequences of the introduction of new species into established ecosystems (such as tropical fish in Banff Hot Springs, starlings, quack grass, scented chamomile, purple loosestrife) and discuss the responsibility of society to protect the environment through science and technology*

20–B1.2sts explain how conventions of mathematics, nomenclature and notation provide a basis for organizing and communicating scientific theory, relationships and concepts **(NS6b)**
- *research the historical development of the modern classification system*
- *research plant and animal systems of classification developed by Aboriginal peoples in their cultural practices.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain that the biosphere is composed of ecosystems, each with distinctive biotic and abiotic characteristics.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–B1.1s formulate questions about observed relationships; plan investigations of questions, ideas, problems and issues; and define and delimit problems to facilitate investigation

- hypothesize the role of biotic and abiotic factors in ecosystems; *e.g., competition and chinooks* **(IP–NS3) [ICT C6–4.1]**
- *plan a field study to gather and evaluate biotic and abiotic characteristics associated with an ecosystem, such as the effects that dominant plants have on abiotic conditions such as soil and microclimate* **(IP–NS1, IP–NS2, IP–NS3, IP–NS4)**.

Performing and Recording

Students will:

20–B1.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform a field study to measure, quantitatively, appropriate abiotic characteristics of an ecosystem and to gather, both quantitatively and qualitatively, evidence for analysis of the diversity of life in the ecosystem studied **(PR–NS3, PR–NS4, PR–NS5) [ICT F2–4.1]**
- *research and develop a land reclamation strategy for a disturbed area, as a solution to environmental damage; e.g., open-pit mine, garbage dump, school yard reclamation* **(PR–SEC1, PR–NS1, PR–NS4) [ICT C1–4.1]**.

Analyzing and Interpreting

Students will:

20–B1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- apply classification and binomial nomenclature systems in a field study **(AI–NS1)**
- analyze the interrelationship of biotic and abiotic characteristics that make up the ecosystem studied **(AI–NS2, AI–NS3, AI–NS6)**
- evaluate the accuracy and reliability of instruments used for measurement and identify the degree of error in the field-study data **(AI–NS4)**
- *compile and organize evidence from a variety of sources, for or against human activity being responsible for ecosystem change, and analyze the relationship between human activity and changing ecosystems* **(AI–NS2, AI–NS6, AI–SEC2) [ICT C2–4.1, C7–4.2]**.

Communication and Teamwork

Students will:

20–B1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively to gather and share data on a field trip* **(CT–NS1, CT–NS2)**
- *work cooperatively to make clear and logical arguments to defend a decision on a given issue, such as human impact on ecosystems, land reclamation or wildlife habitat preservation* **(CT–SEC1, CT–SEC2, CT–SEC3) [ICT C1–4.4]**
- *develop, present and defend a strategy to improve wildlife habitats* **(CT–SEC3) [ICT C1–4.4]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the mechanisms involved in the change of populations over time.

Specific Outcomes for Knowledge

Students will:

20–B2.1k explain that variability in a species results from heritable mutations and that some mutations may have a selective advantage

20–B2.2k discuss the significance of sexual reproduction to individual variation in populations and to the process of evolution

20–B2.3k compare Lamarckian and Darwinian explanations of evolutionary change

20–B2.4k summarize and describe lines of evidence to support the evolution of modern species from ancestral forms; i.e., the fossil record, Earth's history, biogeography, homologous and analogous structures, embryology, biochemistry

20–B2.5k explain speciation and the conditions required for this process

20–B2.6k describe modern evolutionary theories; i.e., punctuated equilibrium, gradualism.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–B2.1sts explain that scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**

- *discuss the nature of science as a way of knowing (contributions of Buffon, Lyell, Malthus and Wallace to evolution and contributions of Aristotle, Galileo and Popper to the philosophy of science)*
- *describe how paleontology and the role of evidence in the accumulation of knowledge have provided invaluable data for theories explaining observable variations in organisms over time (Burgess Shale)*
- *discuss geologic evidence and probable causes for past mass extinctions and contrast these to the forces driving the current decline in species.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the mechanisms involved in the change of populations over time.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–B2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an investigation to measure or describe an inherited variation in a plant or an animal population **(IP–NS1, IP–NS2, IP–NS3, IP–NS4)**
- hypothesize the adaptive significance of the variations in a range of homologous structures in extant and extinct organisms **(IP–NS3)**.

Performing and Recording

Students will:

20–B2.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- *gather data, actual or simulated, on organisms to demonstrate how inherited characteristics change over time, as illustrated by Darwin's finches, peppered moths, bacteria and domesticated plants and animals* **(PR–NS1, PR–NS4)**.

Analyzing and Interpreting

Students will:

20–B2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze data, actual or simulated, on plants and animals to demonstrate how morphology changes over time; *e.g., Darwin's finches, peppered moths, bacteria, domesticated plants or animals* **(AI–NS2) [ICT C6–4.2, C7–4.2]**
- *analyze DNA sequences from online or other sources to infer the relationship between different organisms at various classification levels* **(AI–NS2) [ICT C1–4.1]**
- *state a conclusion or generalization based on research data, suggesting how it supports or refutes an explanation for biological change, and identify new questions or problems that arise from what was learned* **(AI–NS5, AI–NS6) [ICT C7–4.2]**.

Communication and Teamwork

Students will:

20–B2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate ideas, plans and results **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit C: Photosynthesis and Cellular Respiration

Themes: Energy, Matter and Systems

Overview: The life processes of photosynthesis and cellular respiration allow for the transfer of energy and matter. Students learn, in general terms, how energy from sunlight is transferred into adenosine triphosphate (ATP) and reduced nicotinamide adenine dinucleotide phosphate (NADPH) and eventually into glucose, and how carbohydrates are oxidized to produce reduced nicotinamide adenine dinucleotide (NADH), reduced flavin adenine dinucleotide (FADH) and eventually ATP. A detailed knowledge of metabolic intermediates is not required.

Students extend their understanding by examining how these cellular processes impact and are impacted by global systems.

This unit builds on:

- Grade 7 Science, Unit B: Plants for Food and Fibre
- Science 10, Unit C: Cycling of Matter in Living Systems

Unit C will require approximately 15% of the time allotted for Biology 20.

Links to Mathematics: None

Focusing Questions: How does light energy from the environment enter living systems? How is the energy from light converted to chemical potential in organic matter? How is the energy in organic matter released for use by living systems? How do humans in their application of technologies impact photosynthesis and cellular respiration?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. relate photosynthesis to storage of energy in organic compounds
2. explain the role of cellular respiration in releasing potential energy from organic compounds.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- absorption of light by pigments
- light-dependent and independent reactions
- glycolysis
- Krebs cycle
- electron transport systems
- aerobic and anaerobic respiration

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General Outcome 1
Students will relate photosynthesis to storage of energy in organic compounds.

Specific Outcomes for Knowledge

Students will:

20–C1.1k explain, in general terms, how energy is absorbed by pigments, transferred through the reduction of nicotinamide adenine dinucleotide phosphate (NADP) to NADPH, and then transferred as chemical potential energy to ATP by chemiosmosis; and describe where in the chloroplast these processes occur

20–C1.2k explain, in general terms, how the products of the light-dependent reactions, NADPH and ATP, are used to reduce carbon in the light-independent reactions for the production of glucose; and describe where in the chloroplast these processes occur.

Note: Detailed knowledge of metabolic intermediates is not required.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

20–C1.1sts explain how scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4, F2–4.8]**

- *analyze the role of photosynthesis as the biological basis of agriculture and forestry*

20–C1.2sts explain that the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7) [ICT F3–4.1]**

- *research and analyze the effects of herbicides on the biochemistry of photosynthesis.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will relate photosynthesis to storage of energy in organic compounds.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–C1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *identify a testable factor that would affect the rate of photosynthesis* **(IP–NS1)**
- *predict and hypothesize the effect of changes in carbon dioxide and oxygen concentration on photosynthesis* **(IP–NS3) [ICT C6–4.1]**.

Performing and Recording

Students will:

20–C1.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- *use local histories obtained from Aboriginal Elders to describe the importance of plant productivity to human sustainability* **(PR–SEC2)**
- *measure rates of evapotranspiration under various environmental conditions and relate these rates to photosynthetic activity* **(PR–NS2, PR–NS3, PR–NS4)**
- *investigate and integrate, from print and electronic sources, information on the C_3 and C_4 photosynthetic mechanisms or on the applications of cellular biochemistry in medicine or industry* **(PR–NS1, PR–NS4) [ICT C1–4.1]**.

Analyzing and Interpreting

Students will:

20–C1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- collect and interpret data from chromatography experiments and calculate reference flow (R_f) values **(PR–NS3, AI–NS2, AI–NS3, AI–NS4) [ICT F1–4.2]**
- *draw an analogy between the storage of energy by photosynthesis and the storage of energy by solar generating systems* **(AI–NS6)**
- *explain how data supports or refutes the hypothesis on how changes in carbon dioxide and oxygen concentration affect photosynthesis* **(AI–NS4)**
- *collect and interpret experimental data that demonstrates that plant leaves produce starch in the presence of light* **(PR–NS3, AI–NS2)**.

Communication and Teamwork

Students will:

20–C1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively as a group to investigate, synthesize and present information on the effects of herbicides on the biochemistry of photosynthesis* **(CT–SEC1, CT–SEC2, CT–SEC3) [ICT C1–4.4, C7–4.2]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the role of cellular respiration in releasing potential energy from organic compounds.

Specific Outcomes for Knowledge

Students will:

20–C2.1k explain, in general terms, how glucose is oxidized during glycolysis and the Krebs cycle to produce reducing power in NADH and FADH; and describe where in the cell these processes occur

Note: Detailed knowledge of metabolic intermediates is not required.

20–C2.2k explain, in general terms, how chemiosmosis converts the reducing power of NADH and FADH to store chemical potential energy as ATP; and describe where in the mitochondrion these processes occur

Note: Detailed knowledge of metabolic intermediates is not required.

20–C2.3k distinguish, in general terms, between aerobic and anaerobic respiration and fermentation in plants, animals and yeast

20–C2.4k summarize and explain the role of ATP in cellular metabolism; *e.g.,*

- *active transport*
- *cytoplasmic streaming*
- *phagocytosis*
- *biochemical synthesis*
- *muscle contraction*
- *heat production.*

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

20–C2.1sts explain that science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.4, F2–4.8]**

- *research applications of cellular biochemistry in health and industry:*
  - *aerobic and anaerobic fitness*
  - *methane gas production from organic waste*
  - *alcohol production*
  - *bread making*
  - *yogurt*

20–C2.2sts explain that science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F3–4.1]**

- *discuss how pollutants such as hydrogen sulfide and cyanide are by-products of industrial processes and explain the specific metabolic effects of these pollutants on aerobic organisms.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the role of cellular respiration in releasing potential energy from organic compounds.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–C2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *identify factors affecting the rate of cellular respiration* **(IP–NS1)**
- *design an experiment to demonstrate that heat is a by-product of cellular respiration* **(IP–NS1, IP–NS2, IP–NS3, IP–NS4)**
- *predict and hypothesize the effect of oxic and anoxic conditions on the rate of cellular respiration in unicellular organisms such as yeast and bacteria* **(IP–NS3) [ICT C6–4.1]**.

Performing and Recording

Students will:

20–C2.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- use experimental methods to demonstrate, quantitatively, the oxygen consumption of germinating seeds **(PR–NS2, PR–NS3, PR–NS4, PR–NS5)**
- measure temperature change over time of germinating and non-germinating seeds **(PR–NS2, PR–NS3, PR–NS4, PR–NS5)**
- investigate and integrate, from print and electronic sources, information on the action of metabolic toxins on cellular respiration **(PR–NS1, PR–NS4) [ICT C1–4.1]**.

Analyzing and Interpreting

Students will:

20–C2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- *evaluate the reliability, accuracy and validity of sources used to collect information on metabolic toxins and cellular respiration* **(AI–NS4) [ICT C3–4.1]**
- *interpret data on the oxygen consumption of an animal and relate this to metabolic rate* **(AI–NS2, AI–NS3, AI–NS4, AI–NS6)**
- *interpret data that illustrate the effect of oxic and anoxic conditions on cellular respiration* **(AI–NS6) [ICT C7–4.2]**
- *relate the Aboriginal metaphor "the trees are the lungs of Mother Earth" to the complementary role of the carbon and oxygen cycles* **(AI–NS6)**.

Communication and Teamwork

Students will:

20–C2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *create a concept map or flow chart to illustrate how the carbon, hydrogen and oxygen atoms in glucose are ultimately released as carbon dioxide and water*
- *work cooperatively to research and investigate cellular respiration in oxic and anoxic conditions and metabolic toxins* **(CT–SEC1) [ICT C1–4.1]**.

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Unit D: Human Systems

Themes: Energy, Equilibrium, Matter and Systems

Overview: Maintenance of metabolic equilibrium in organisms involves a number of physical and biochemical processes. The human organism is used as a model system to examine how energy and matter are exchanged with the environment through the processes of gas exchange, digestion, excretion, circulation and the function of the motor system. A defence system contributes to equilibrium by eliminating pathogenic organisms.

The content in Unit D prepares students for further studies regarding the functioning of human systems.

This unit builds on:

- Grade 8 Science, Unit B: Cells and Systems
- Science 10, Unit C: Cycling of Matter in Living Systems

Unit D will require approximately 40% of the time allotted for Biology 20.

Links to Mathematics: None

Focusing Questions: How do specialized structures function in the overall biochemical balance of the living system? What conditions result if these structures do not function normally? How does knowledge of living systems and medical technology support the prevention and treatment of disorders?

General Outcomes: There are four major outcomes in this unit.

Students will:

1. explain how the human digestive and respiratory systems exchange energy and matter with the environment
2. explain the role of the circulatory and defence systems in maintaining an internal equilibrium
3. explain the role of the excretory system in maintaining an internal equilibrium in humans through the exchange of energy and matter with the environment
4. explain the role of the motor system in the function of other body systems.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- structure and function of major systems: respiratory, digestive, excretory, circulatory and motor
- chemical nature of carbohydrates, proteins, lipids
- chemical and physical digestion
- digestive enzymes
- gas exchange
- composition of blood
- immune response
- renal function
- muscle contraction

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General Outcome 1
Students will explain how the human digestive and respiratory systems exchange energy and matter with the environment.

Specific Outcomes for Knowledge

Students will:

20–D1.1k identify the principal structures of the digestive and respiratory systems; i.e.,
- mouth, esophagus, stomach, sphincters, small and large intestines, liver, pancreas, gall bladder
- nasal passages, pharynx, larynx, epiglottis, trachea, bronchi, bronchioles, alveoli, diaphragm, rib muscles, pleural membranes

20–D1.2k describe the chemical nature of carbohydrates, lipids and proteins and their enzymes; i.e., carbohydrases, lipases and proteases

20–D1.3k explain enzyme action and factors influencing their action; i.e., temperature, pH, substrate concentration, feedback inhibition, competitive inhibition

20–D1.4k describe the chemical and physical processing of matter through the digestive system into the circulatory system

20–D1.5k explain the exchange of matter and the transfer of thermal energy between the body and the environment, using the mechanism of breathing in gas exchange, removal of foreign material and heat loss.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

20–D1.1sts explain that the goal of technology is to provide solutions to practical problems **(ST1) [ICT F2–4.4, F2–4.8]**
- *discuss and evaluate the role of food additives and/or food treatment to solve the problems of food spoilage (antioxidants, irradiation technology)*
- *explain the biological basis of nutritional deficiencies, including that of anorexia nervosa, and the technological means available to restore internal equilibrium*
- *identify specific pathologies of the digestive system and technologies used to treat the conditions*
- *identify specific pathologies of the respiratory system and technologies used to treat the conditions*

20–D1.2sts explain that the products of technology are devices, systems and processes that meet given needs; however, these products cannot solve all problems **(ST6) [ICT F2–4.4]**
- *assess the physiological effects of smoking and exposure to second-hand smoke and the limitations of technologies available to deal with these conditions or diseases*
- *assess the short- and long-term impacts of smoking in society, such as the cost of health care and insurance.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain how the human digestive and respiratory systems exchange energy and matter with the environment.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–D1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design an investigation to examine food energy through calorimetry, to examine enzyme action or to examine the mechanics of breathing* **(IP–NS1, IP–NS2, IP–NS3, IP–NS4).**

Performing and Recording

Students will:

20–D1.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- observe, through dissection or computer simulations, the digestive and respiratory systems of a representative mammal and identify the major structural components **(PR–NS2, PR–NS4, PR–NS5)**
- perform experiments, using qualitative tests, to detect the presence of carbohydrates, proteins and lipids **(PR–NS2, PR–NS3, PR–NS4, PR–NS5)**
- *perform an experiment to investigate the influence of enzyme concentration, temperature or pH on the activity of enzymes such as pepsin and pancreatin* **(PR–NS2, PR–NS3, PR–NS4, PR–NS5)**
- *perform an experiment to examine the mechanics of breathing, such as lung volume, breathing rate* **(PR–NS2, PR–NS3, PR–NS4, PR–NS5).**

Analyzing and Interpreting

Students will:

20–D1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- *analyze and draw conclusions and assess validity of data from an investigation on calorimetry or enzyme action* **(AI–NS2, AI–NS3, AI–NS4, AI–NS6) [ICT C7–4.2]**
- *analyze and draw conclusions and assess validity of data from an investigation on the mechanics of breathing* **(AI–NS2, AI–NS3, AI–NS4, AI–NS6) [ICT C7–4.2].**

Communication and Teamwork

Students will:

20–D1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate notation and units to present data from investigations on digestion and respiration **(CT–NS1, CT–NS2)**
- *work cooperatively with team members to investigate how Aboriginal peoples and ranchers have used their observations of the excrement of game and farm animals to assess the health of these animals* **(CT–NS1)**
- *work cooperatively with team members to research the contributions from various cultures to our current understanding of digestion or respiration and healing, such as research on the use of traditional remedies to treat respiratory illness* **(CT–NS1).**

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General Outcome 2
Students will explain the role of the circulatory and defence systems in maintaining an internal equilibrium.

Specific Outcomes for Knowledge

Students will:

20–D2.1k identify the principal structures of the heart and associated blood vessels; i.e., atria, ventricles, septa, valves, aorta, venae cavae, pulmonary arteries and veins, sinoatrial node, atrioventricular node, Purkinje fibres

20–D2.2k describe the action of the heart, blood pressure and the general circulation of blood through coronary, pulmonary and systemic pathways

20–D2.3k describe the structure and function of blood vessels; i.e., arteries, veins and capillaries

20–D2.4k describe the main components of blood and their role in transport, clotting and resisting the influence of pathogens; i.e., plasma, erythrocytes, platelets, leucocytes

20–D2.5k explain the role of the circulatory system at the capillary level in aiding the digestive, excretory, respiratory and motor systems' exchange of energy and matter with the environment

20–D2.6k explain the role of blood in regulating body temperature

20–D2.7k describe and explain, in general terms, the function of the lymphatic system

20–D2.8k list the main cellular and noncellular components of the human defence system and describe their role; i.e., skin, macrophage, helper T cell, B cell, killer T cell, suppressor T cell, memory T cell

20–D2.9k describe the ABO and Rh blood groups on the basis of antigens and antibodies.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

20–D2.1sts explain how Canadian society supports scientific research and technological development to facilitate a sustainable society, economy and environment **(SEC4a) [ICT F2–4.2, F2–4.8]**

- *identify specific pathologies of the circulatory and defence systems, the technologies used to treat the conditions and the reasons society supports the development of these technologies*
- *evaluate the effects that the needs, interests and financial support of society have on preventing the spread of pathogens such as staphylococcus, smallpox virus, E. coli and human immunodeficiency virus (HIV)*
- *assess the physiological effects of drugs such as caffeine and nicotine on the circulatory system and discuss why habitual use of these drugs is a societal concern*
- *evaluate the risks and benefits associated with blood transfusion*

20–D2.2sts explain that decisions regarding the application of scientific and technological developments involve a variety of perspective, including social, cultural, environmental, ethical and economic considerations **(SEC4b) [ICT F2–4.2, F3–4.1]**

- *evaluate the ethical implications of organ and tissue transplants, in terms of the needs, interests and financial support of society, on scientific and technological research in this field*
- *assess the implications of technological advances that assist in maintaining internal equilibrium with respect to:*
  - *pathogens (vaccinations)*
  - *defective hearts (artificial valves, artificial hearts, xenotransplantation, stem cell culture).*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the role of the circulatory and defence systems in maintaining an internal equilibrium.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–D2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design procedures to investigate factors affecting heart rate and blood pressure; e.g., physical activity, emotion, gender and chemicals such as caffeine* **(IP–NS1, IP–NS2, IP–NS3, IP–NS4).**

Performing and Recording

Students will:

20–D2.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- measure blood pressure and observe blood flow in capillaries in an organism or through demonstration in a virtual laboratory **(PR–NS2, PR–NS3)**
- determine the morphology and abundance of cellular components in a prepared human blood slide **(PR–NS2, PR–NS3)**
- select and integrate information from various sources to observe the principal features of a mammalian circulatory system and the direction of blood flow, and identify structures from drawings; *e.g., valves, chambers* **(PR–NS1)**
- research and design a simulation or model of the functioning of the main components of the human immune system **(PR–NS1, PR–ST2) [ICT C6–4.4]**
- *compile and display information on blood pressure, heart rate and blood composition* **(PR–NS1, PR–NS4)**
- *carry out a heart dissection to identify the major parts and to determine the directional flow of blood through the organ* **(PR–NS3).**

Analyzing and Interpreting

Students will:

20–D2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- *determine, from available data, the relationship between blood pressure and exercise* **(AI–NS2) [ICT C7–4.2]**
- *investigate lifestyle behaviour, physical fitness and heart rate recovery, using available data, and account for discrepancies* **(AI–NS2, AI–NS3) [ICT C7–4.2]**
- *identify the limitations and evaluate the dependability of devices used to measure blood pressure* **(AI–NS4) [ICT C6–4.5]**
- *explore solutions to practical problems associated with the circulatory system, such as organ and tissue transplants and artificial blood* **(AI–ST2) [ICT C1–4.1]**
- *determine blood groups from samples of artificial blood or electronic resources* **(AI–NS6)**
- *predict compatibility of ABO and Rh blood types between donor and recipient* **(AI–NS6).**

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General Outcome 2
Students will explain the role of the circulatory and defence systems in maintaining an internal equilibrium.

Communication and Teamwork

Students will:

20–D2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively with team members to measure and record blood pressure, heart rate or any other factor relating to the circulatory system* **(CT–NS1, CT–NS2) [ICT C6–4.4]**.

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General Outcome 3
Students will explain the role of the excretory system in maintaining an internal equilibrium in humans through the exchange of energy and matter with the environment.

Specific Outcomes for Knowledge

Students will:

20–D3.1k identify the principal structures in the excretory system; i.e., kidneys, ureters, urinary bladder, urethra

20–D3.2k identify the major and associated structures of the nephron, including the glomerulus, Bowman's capsule, tubules, loop of Henle, collecting duct, afferent and efferent arterioles, and capillary net, and explain their function in maintaining plasma compositions (i.e., water, pH, ions)

20–D3.3k describe the function of the kidney in excreting metabolic wastes and expelling them into the environment

20–D3.4k identify the role of antidiuretic hormone (ADH) and aldosterone in water and sodium ion reabsorption, excretion and blood pressure regulation.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–D3.1sts explain that the goal of science is knowledge about the natural world **(NS1)**

- *examine how lifestyle factors contribute to hypertension and affect kidney function:*
  - *drugs, such as alcohol and nicotine*
  - *sedentary lifestyle*
  - *dietary excesses or deficiencies*
  - *stress*
- *explain how an understanding of nephron function is applied to renal and peritoneal dialysis*
- *identify specific pathologies of the excretory system and the scientific knowledge connected with the treatment*
  - *identify the physiological complexities and challenges of organ and tissue transplants.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain the role of the excretory system in maintaining an internal equilibrium in humans through the exchange of energy and matter with the environment.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–D3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *predict how blood pressure affects urine composition and volume* **(IP–NS3) [ICT C6–4.1].**

Performing and Recording

Students will:

20–D3.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- research and create a flowchart to describe how humans maintain homeostasis with respect to water and ions; *e.g.,*
  - *when water intake is increased or decreased*
  - *when diuretic compounds, such as caffeine or alcohol, are ingested*
  - *when excessive sodium is ingested*
  - *after periods of intense exercise, fever, hemorrhage* **(PR–NS1)**
- *perform a kidney dissection to identify major structures of the organ* **(PR–NS3).**

Analyzing and Interpreting

Students will:

20–D3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- observe the principal features of a mammalian excretory system and identify structures from drawings obtained from various print and electronic sources **(AI–NS1) [ICT C1–4.1]**
- collect and interpret data in analysis of simulated urine, identify limitations of the data, compare the data to theoretical values and produce a generalization **(PR–NS2, PR–NS3, PR–NS4, PR–NS5, AI–NS2, AI–NS4, AI–NS6) [ICT C7–4.2]**
- *assess technological solutions to kidney failure, such as peritoneal dialysis, hemodialysis and kidney transplant, and identify the potential strengths and weaknesses of each* **(AI–ST2).**

Communication and Teamwork

Students will:

20–D3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively with team members to assess and record simulated urine composition* **(CT–NS1, CT–NS2).**

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 4
Students will explain the role of the motor system in the function of other body systems.

Specific Outcomes for Knowledge

Students will:

20–D4.1k explain how the motor system supports body functions (i.e., digestive, circulatory, respiratory, excretory and locomotory), referencing smooth, cardiac and striated muscle

20–D4.2k describe, in general, the action of actin and myosin in muscle contraction and heat production.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–D4.1sts explain that concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**

- *analyze the effects of exercise on muscle fibre*
- *describe the relationship between fitness and efficiency of muscle action*
- *assess the physiological effects on the motor system of anabolic steroids and energy-enhancing drugs such as creatine phosphate*

20–D4.2sts explain that the goal of technology is to provide solutions to practical problems **(ST1)** **[ICT F2–4.4, F2–4.8]**

- *identify specific pathologies of the motor system, such as muscle atrophy, fatigue, strain and tendonitis, and identify technologies used to treat the conditions.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 4
Students will explain the role of the motor system in the function of other body systems.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–D4.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design an investigation to determine the relationship between muscle activity, energy consumption and fatigue* **(IP–NS1, IP–NS2, IP–NS3, IP–NS4)**.

Performing and Recording

Students will:

20–D4.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- identify smooth, cardiac and striated muscle tissue under magnification **(PR–NS2)**
- *design and construct a model of a muscle fibre* **(PR–ST2)**.

Analyzing and Interpreting

Students will:

20–D4.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- *obtain and interpret data to demonstrate a direct correlation between energy use by muscle cells and heat production* **(AI–NS2)**.

Communication and Teamwork

Students will:

20–D4.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate SI notation and fundamental and derived units **(CT–NS2)**
- *work cooperatively with team members to measure and record body temperature* **(CT–NS1)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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BIOLOGY 30

Provincial implementation of Biology 30 is September 2008.
Implementation prior to this date is **not** approved.

Biology 30 consists of four units of study:

A. Nervous and Endocrine Systems
B. Reproduction and Development
C. Cell Division, Genetics and Molecular Biology
D. Population and Community Dynamics

Attitude Outcomes

Students will be encouraged to develop positive attitudes that support the responsible acquisition and application of knowledge related to science and technology. The following attitude outcomes are to be developed throughout Biology 30, in conjunction with the specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills in each unit.

Interest in Science

Students will be encouraged to:
show interest in science-related questions and issues and confidently pursue personal interest and career possibilities within science-related fields; *e.g.,*

- *research the answers to questions they generate*
- *explore and use a variety of methods and resources to increase their knowledge and skills*
- *be critical and constructive when considering new theories and techniques*
- *use scientific vocabulary and principles in everyday discussions*
- *recognize the usefulness of being skilled in mathematics and problem solving*
- *be interested in science and technology topics not directly related to their formal studies*
- *recognize the importance of making connections between various science disciplines*
- *maintain interest in pursuing further studies in science*
- *explore where further science- and technology-related studies and careers can be pursued*
- *recognize that part-time jobs require science- and technology-related knowledge and skills.*

Mutual Respect

Students will be encouraged to:
appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds; *e.g.,*

- *use a multiperspective approach, considering scientific, technological, economic, cultural, political and environmental factors when formulating conclusions, solving problems or making decisions on an STS issue*
- *research carefully and discuss openly ethical dilemmas associated with the applications of science and technology*
- *explore personal perspectives, attitudes and beliefs toward scientific and technological advancements*
- *recognize the contribution of science and technology to the progress of civilizations*
- *show support for the development of technologies and science as they relate to human needs*
- *recognize that the scientific approach is one of many ways of viewing the universe*
- *recognize the research contributions of both men and women*
- *recognize the research contributions of Canadians.*

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Scientific Inquiry

Students will be encouraged to:
seek and apply evidence when evaluating alternative approaches to investigations, problems and issues; *e.g.,*

- *consider the social and cultural contexts in which a theory developed*
- *appreciate how scientific problem solving and the development of new technologies are related*
- *insist on evidence before accepting a new idea or a new explanation*
- *assess, critically, their opinion of the value of science and its applications*
- *question arguments in which evidence, explanations or positions do not reflect the diversity of perspectives that exist*
- *criticize arguments based on faulty, incomplete or misleading use of numbers*
- *recognize the importance of reviewing the basic assumptions from which a line of inquiry has arisen*
- *insist that the critical assumptions behind any line of reasoning be made explicit, so that the validity of the position taken can be judged*
- *evaluate inferences and conclusions, being cognizant of the many variables involved in experimentation*
- *ask questions and conduct research to ensure understanding*
- *expend the effort and time needed to make valid inferences*
- *seek new models, explanations and theories when confronted with discrepant events.*

Collaboration

Students will be encouraged to:
work collaboratively in planning and carrying out investigations and in generating and evaluating ideas; *e.g.,*

- *provide the same attention and energy to the group's product as they would to a personal assignment*
- *be attentive when others speak, seek the point of view of others, and consider a multitude of perspectives*
- *use appropriate communication technology to elicit feedback from others*
- *participate in a variety of electronic group formats.*

Stewardship

Students will be encouraged to:
demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment; *e.g.,*

- *assume part of the collective responsibility for the impact of humans on the environment*
- *participate in civic activities related to the preservation and judicious use of the environment and its resources*
- *encourage their peers or members of their community to participate in a project related to sustainability*
- *consider all perspectives when addressing issues, weighing scientific, technological and ecological factors*
- *discuss both the positive and negative effects of environmental changes caused by nature and by humans on human beings and society*
- *participate in the social and political systems that influence environmental policy in their community*
- *promote actions that are not injurious to the environment*

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- *make personal decisions based on a feeling of responsibility toward less privileged parts of the global community and toward future generations*
- *be critical-minded regarding the short- and long-term consequences of sustainability.*

Safety

Students will be encouraged to:
show concern for safety in planning, carrying out and reviewing activities with reference to WHMIS and consumer product labelling information; *e.g.,*

- *consider safety a positive limiting factor in scientific and technological endeavours*
- *read the labels on materials before using them, interpret the WHMIS symbols, and consult a reference document if safety symbols are not understood*
- *manipulate materials carefully, being cognizant of the risks and consequences of their actions*
- *assume responsibility for the safety of all those who share a common working environment by cleaning up after an activity and disposing of materials according to safety guidelines*
- *seek assistance immediately for any first aid concerns, such as cuts, burns or unusual reactions*
- *keep the work station uncluttered, ensuring that only appropriate laboratory materials are present*
- *criticize a procedure, a design or materials that are not safe or that could have a negative impact on the environment*
- *write safety and waste-disposal precautions into a laboratory procedure*
- *use safety and waste disposal as criteria for evaluating an experiment.*

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Unit A: Nervous and Endocrine Systems

Themes: Equilibrium and Systems

Overview: This unit examines the biological processes that mediate the interactions between humans and their environment to maintain equilibrium. The nervous system contributes to homeostasis through its response to internal and external stimuli. Endocrine glands help to maintain homeostasis through the hormones they release into the blood. A study of the interactions between the nervous and endocrine systems leads to an examination of the functioning of the central and peripheral nervous systems and their ability to sense the environment and respond to it.

This unit builds on:

- Grade 8 Science, Unit B: Cells and Systems
- Science 10, Unit C: Cycling of Matter in Living Systems
- Biology 20, Unit D: Human Systems

Unit A will require approximately 25% of the time allotted for Biology 30.

Links to Mathematics: None

Focusing Questions: How does the human body maintain equilibrium between its internal and external environments? What physiological processes and control systems are involved in maintaining homeostasis? What medical technologies are available to alleviate disorders of the nervous and endocrine systems?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explain how the nervous system controls physiological processes
2. explain how the endocrine system contributes to homeostasis.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- neuron
- nerve impulse transmission
- central and peripheral nervous systems
- reflex arcs
- sensory receptors
- endocrine system and hormones
- homeostasis and feedback systems
- endocrine and nervous system interactions

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General Outcome 1
Students will explain how the nervous system controls physiological processes.

Specific Outcomes for Knowledge

Students will:

30–A1.1k describe the general structure and function of a neuron and myelin sheath, explaining the formation and transmission of an action potential, including all-or-none response and intensity of response; the transmission of a signal across a synapse; and the main chemicals and transmitters involved, i.e., norepinephrine, acetylcholine and cholinesterase

30–A1.2k identify the principal structures of the central and peripheral nervous systems and explain their functions in regulating the voluntary (somatic) and involuntary (autonomic) systems of the human organism; i.e., cerebral hemispheres and lobes, cerebellum, pons, medulla oblongata, hypothalamus, spinal cord, sympathetic and parasympathetic nervous systems, and the sensory-somatic nervous system

30–A1.3k describe, using an example, the organization of neurons into nerves and the composition and function of reflex arcs; *e.g., the patellar reflex, the pupillary reflex*

30–A1.4k describe the structure and function of the parts of the human eye; i.e., the cornea, lens, sclera, choroid, retina, rods and cones, fovea centralis, pupil, iris and optic nerve

30–A1.5k describe the structure and function of the parts of the human ear, including the pinna, auditory canal, tympanum, ossicles, cochlea, organ of Corti, auditory nerve, semicircular canals and Eustachian tube

30–A1.6k explain other ways that humans sense their environment and their spatial orientation in it; *e.g., olfactory receptors, proprioceptors, taste receptors, receptors in the skin.*

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–A1.1sts explain that scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**

- *discuss the biological basis of neurological diseases such as Alzheimer's or Parkinson's disease and how this relates to treatment*
- *evaluate the impact of photoperiod (light wavelength and duration) on humans and identify adaptations to light deprivation in northern communities*

30–A1.2sts explain that scientific investigation includes the process of analyzing evidence and providing explanations based upon scientific theories and concepts **(NS5f) [ICT C7–4.2]**

- *analyze experimental evidence regarding the influence of anesthetics, drugs and chemicals, natural and synthetic, on the functioning of the nervous system and relate this to addiction theories*
- *analyze the contribution of technological developments and physiological knowledge to longevity and quality of life*

30–A1.3sts explain that the goal of technology is to provide solutions to practical problems **(ST1) [ICT F2–4.4]**

- *investigate technologies available to correct eye defects such as myopia, hyperopia and astigmatism and ear defects such as hearing loss and tinnitus*
- *investigate the biological basis of neurotoxin action and their antidotes (snake venom, box jellyfish, botulin, reserpine [Rauwolfia serpentina])*
- *investigate the use of neurotoxins by Indigenous peoples*
- *discuss how advances in science have contributed to technologies that increase access to the world beyond normal sensory limits.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain how the nervous system controls physiological processes.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–A1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment to investigate heat, cold, pressure and touch receptors **(IP–NS1, IP–NS2, IP–NS3)**.

Performing and Recording

Students will:

30–A1.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- design and perform an experiment to investigate the physiology of reflex arcs **(IP–NS2, PR–NS2, PR–NS3, PR–NS4) [ICT F1–4.2]**
- perform experiments to measure the ability to discriminate objects visually and to hear a range of sounds **(PR–NS2, PR–NS3, PR–NS4)**
- use a microscope and prepared slides to observe neurons and synapses **(PR–NS2, PR–NS3, PR–NS4)**
- observe the principal features of a mammalian brain, eye and ear, using models, computer simulations or dissections, and identify the major structures of those organs **(PR–NS3, PR–NS4) [ICT C6–4.4]**
- *investigate and integrate, from library and electronic sources, information on the impact of photoperiod and wavelength on humans* **(PR–NS1, PR–NS4) [ICT C1–4.1]**
- *compile and display, in appropriate format, data collected from investigations on reflex arcs, stimulus strength versus force of muscle contraction, and/or auditory range* **(PR–NS4) [ICT P2–4.1]**.

Analyzing and Interpreting

Students will:

30–A1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- *interpret patterns and trends in data on strength of stimuli versus force of muscle contraction* **(AI–NS2) [ICT C7–4.2]**
- *analyze and interpret aspects of vision, such as blind spot, acuity, accommodation, adaptation, binocular vision and peripheral vision* **(AI–NS2) [ICT C7–4.2]**
- *analyze a hearing aid as a device that simulates a sensory function* **(AI–ST1)**
- *pose new questions, such as: "Why are some people more tolerant to pain than others?"* **(AI–NS5)**
- *collect and analyze class data on colour charts* **(PR–NS4, AI–NS2) [ICT C7–4.2]**
- *analyze data that shows the interrelationship between taste and smell receptors* **(AI–NS2) [ICT C7–4.2]**.

Communication and Teamwork

Students will:

30–A1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate International System of Units (SI) notation, fundamental and derived units and significant digits **(CT–NS2)**★
- use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate ideas, plans and results **(CT–NS2)**★
- *work cooperatively with group members to investigate neurological disorders such as Alzheimer's or Parkinson's disease* **(CT–NS1)**.

★To be developed throughout the course.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain how the endocrine system contributes to homeostasis.

Specific Outcomes for Knowledge

Students will:

30–A2.1k identify the principal endocrine glands of humans; i.e., the hypothalamus/pituitary complex, thyroid, parathyroid, adrenal glands and islet cells of the pancreas

30–A2.2k describe the function of the hormones of the principal endocrine glands, i.e., thyroid-stimulating hormone (TSH)/thyroxine, calcitonin/parathyroid hormone (PTH), adrenocorticotropic hormone (ACTH)/cortisol, glucagon/insulin, human growth hormone (hGH), antidiuretic hormone (ADH), epinephrine, aldosterone, and describe how they maintain homeostasis through feedback

30–A2.3k explain the metabolic roles hormones may play in homeostasis; i.e., thyroxine in metabolism; insulin, glucagon and cortisol in blood sugar regulation; hGH in growth; ADH in water regulation; aldosterone in sodium ion regulation

30–A2.4k explain how the endocrine system allows humans to sense their internal environment and respond appropriately; *e.g., calcium balance, osmotic pressure of blood*

30–A2.5k compare the endocrine and nervous control systems and explain how they act together; *e.g., stress and the adrenal gland*

30–A2.6k describe, using an example, the physiological consequences of hormone imbalances; i.e., diabetes mellitus *(e.g., diabetes insipidus, gigantism, goitre, cretinism, Graves' disease).*

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–A2.1sts explain that science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.8]**

- *compare the function of technological control systems, such as computer control systems for car emissions, with electrochemical control systems in organisms*
- *assess the impact of research into biochemical control systems on human performance*
- *describe the current treatments for type 1 and type 2 diabetes*

30–A2.2sts explain that science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F2–4.8, F3–4.1]**

- *evaluate the use of biotechnology to solve practical problems (hormone synthesis for diabetes mellitus, dwarfism, milk yield in cows)*
- *evaluate the use of hormone therapy in the treatment of humans (growth hormone and aging, anabolic steroids and human performance)*
- *explain the relationship between pigment deposition within skin cells and ultraviolet light as influenced by stratospheric ozone.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain how the endocrine system contributes to homeostasis.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

30–A2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- formulate a hypothesis, from published data, on an environmental factor that can be detected and responded to by humans; *e.g., stress and hormonal disruption, ultraviolet light and pigment deposition, diet and thyroid function* **(IP–NS3)**.

Performing and Recording

Students will:

30–A2.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- *research seasonal affective disorder (SAD) or general adaptation syndrome and identify the main hormonal and nervous components* **(PR–NS4)**.

Analyzing and Interpreting

Students will:

30–A2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- infer the role of ADH and aldosterone in the maintenance of water and ions, using the analysis and interpretation of data on blood and urine composition **(AI–NS6) [ICT C7–4.2]**
- infer the role of insulin in the regulation of blood sugar by performing an experiment to investigate the presence of glucose in simulated urine and comparing the results with normal urinalysis data, and/or investigate the role of insulin in the regulation of blood sugar by using a computer simulation **(AI–NS6) [ICT C7–4.2]**.

Communication and Teamwork

Students will:

30–A2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *evaluate individual and group processes used in planning and carrying out group investigations of hormone therapy or the use of biotechnology to solve practical problems* **(CT–SEC1, CT–SEC4)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit B: Reproduction and Development

Themes: Change and Systems

Overview: This unit investigates the human reproductive system as a representative mammalian system responsible for propagating the organism and perpetuating the species. The processes associated with human reproduction and development, as well as the regulation of these processes by hormones, are reviewed. The influence of environmental factors on embryonic and fetal development is examined, as are various reproductive technologies.

This unit builds on:

- Grade 8 Science, Unit B: Cells and Systems
- Grade 9 Science, Unit A: Biological Diversity
- Science 10, Unit C: Cycling of Matter in Living Systems
- Biology 20, Unit D: Human Systems

Unit B will require approximately 20% of the time allotted for Biology 30.

Links to Mathematics: None

Focusing Questions: How do the reproductive systems function to ensure survival of the species? What mechanisms are responsible for regulating the reproductive systems? What are the major processes and events of human embryonic and fetal development? How do reproductive technologies affect functioning of the reproductive systems, and what impact do these technologies have on society?

General Outcomes: There are three major outcomes in this unit.

Students will:

1. explain how survival of the human species is ensured through reproduction
2. explain how human reproduction is regulated by chemical control systems
3. explain how cell differentiation and development in the human organism are regulated by a combination of genetic, endocrine and environmental factors.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- male and female reproductive systems
- reproductive hormones
- reproductive technologies
- embryonic and fetal development
- parturition
- lactation

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General Outcome 1
Students will explain how survival of the human species is ensured through reproduction.

Specific Outcomes for Knowledge

Students will:

30–B1.1k identify the structures in the human female reproductive system and describe their functions; i.e., ovaries, Fallopian tubes, uterus, endometrium, cervix, vagina

30–B1.2k identify the structures in the human male reproductive system and describe their functions; i.e., testes, seminiferous tubules, interstitial cells, Sertoli cells, epididymides, vasa (ductus) deferentia, Cowper's glands, seminal vesicles, prostate gland, ejaculatory duct, urethra, penis

30–B1.3k distinguish sperm and egg from their supporting structures; i.e., seminiferous tubules, interstitial cells, Sertoli cells, follicle, corpus luteum

30–B1.4k describe the chromosomal factors and hormonal influence on the formation of the gonads and reproductive organs in the female and male embryo and fetus; i.e., Y chromosome and role of testosterone

30–B1.5k explain how sexually transmitted infections (STIs) can interfere with fertility and reproduction; *e.g., chlamydia, gonorrhea, human papilloma virus.*

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–B1.1sts explain that decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b)**

- *evaluate the implications of a reproductive technology for human biology*
- *consider the application of long-term scientific and technological solutions to population control, using the Aboriginal concept of seven generations*
- *discuss society's expectations of the scientific community with respect to reproductive technologies*
- *discuss the impact of STIs on individuals, considering the physiological damage they cause.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain how survival of the human species is ensured through reproduction.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

30–B1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *identify ethical concerns about reproductive technologies, infertility and the transmission of STIs* **(IP–SEC1)**.

Performing and Recording

Students will:

30–B1.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- observe the principal features of the human reproductive system, using models or computer simulations, and identify the major structures from drawings **(PR–NS4) [ICT C6–4.4]**
- use a microscope to observe prepared slides of ovaries and testes so as to distinguish eggs and sperm from their supporting structures; i.e., follicle, corpus luteum, interstitial cells, Sertoli cells, seminiferous tubules **(PR–NS2, PR–NS4)**.

Analyzing and Interpreting

Students will:

30–B1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- evaluate practical solutions to decreased fertility; i.e., low sperm count, difficulty in egg production, hormonal imbalance **(AI–ST2, AI–SEC2)**
- *evaluate information collected from library and electronic sources on the implications of reproductive technologies such as surrogacy, sperm banks and cloning* **(AI–SEC2, AI–SEC4) [ICT C1–4.1, C3–4.1, C3–4.2]**.

Communication and Teamwork

Students will:

30–B1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively as a team to research the damage to reproductive organs caused by STIs and use appropriate multimedia to present the findings to the class* **(CT–SEC1, CT–SEC2) [ICT C1–4.4, P3–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain how human reproduction is regulated by chemical control systems.

Specific Outcomes for Knowledge

Students will:

30–B2.1k describe the role of hormones, i.e., gonadotropic-releasing hormone (GnRH), follicle-stimulating hormone (FSH), luteinizing hormone (LH), estrogen, progesterone, testosterone, in the regulation of primary and secondary sex characteristics in females and males

30–B2.2k identify the principal reproductive hormones in the female and explain their interactions in the maintenance of the menstrual cycle; i.e., estrogen, progesterone, FSH, LH

30–B2.3k identify the principal reproductive hormones in the male and explain their interactions in the maintenance and functioning of the male reproductive system; i.e., testosterone, FSH, LH.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–B2.1sts explain how science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2)**

- *research and assess the effects of the medical use of reproductive hormones on humans*
- *research and assess the implications for humans of producing and using reproductive hormones in domestic animals, such as cattle and horses*

30–B2.2sts explain why decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b) [ICT F2–4.2, F3–4.1]**

- *explain how reproductive hormone homeostasis is disrupted by the natural aging process and discuss whether available technologies, such as hormone treatment for menopause and andropause, should be used to restore balance.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain how human reproduction is regulated by chemical control systems.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

30–B2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design an investigation to determine at which point during the menstrual cycle a female is most fertile* **(IP–NS2, IP–NS3, IP–NS4).**

Performing and Recording

Students will:

30–B2.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- graph the changes in estrogen, progesterone, FSH and LH levels in the blood of a female through a single menstrual cycle **(PR–NS4) [ICT C6–4.2]**
- identify the follicle and corpus luteum within the ovary, using models, diagrams or computer simulations **(PR–NS4) [ICT C6–4.4].**

Analyzing and Interpreting

Students will:

30–B2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze blood hormone data and physiological events for a single menstrual cycle, inferring the roles of female sex hormones **(AI–NS2, AI–NS6)**
- analyze blood hormone data and physiological events, inferring the roles of male sex hormones **(AI–NS2, AI–NS6) [ICT C7–4.2]**
- *research and assess the effects of the medical use of reproductive hormones on conditions such as menopause, andropause and infertility* **(PR–SEC1, AI–SEC2, AI–SEC4) [ICT C7–4.2].**

Communication and Teamwork

Students will:

30–B2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numerical and graphical modes of representation to communicate information on changing reproductive hormone levels in the blood **(CT–ST2)**
- *work cooperatively with team members to investigate the impact of the use of reproductive hormones in agriculture on the environment (such as the feminization of fish) and, using appropriate multimedia, present the information to the class* **(CT–SEC1, CT–SEC2, CT–SEC3) [ICT C1–4.4, P3–4.1].**

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain how cell differentiation and development in the human organism are regulated by a combination of genetic, endocrine and environmental factors.

Specific Outcomes for Knowledge

Students will:

30–B3.1k trace the processes of fertilization, implantation and extra-embryonic membrane formation, i.e., placenta, amnion, chorion, allantois, followed by embryonic and fetal development, parturition and lactation, and describe the control mechanisms of these events, i.e., progesterone, LH, human chorionic gonadotropin (hCG), prostaglandins, oxytocin, prolactin

30–B3.2k describe development from fertilization to parturition in the context of the main physiological events that occur in the development of organ systems during each major stage (trimester); i.e., zygote, blastocyst, gastrulation, general morphogenesis

30–B3.3k identify major tissues and organs that arise from differentiation and morphological development of the ectoderm, mesoderm and endoderm in the embryo; i.e.,
- ectoderm: nervous system, epidermis
- mesoderm: skeleton, muscles, reproductive structures
- endoderm: lining of the digestive and respiratory systems, endocrine glands

30–B3.4k describe the influence of environmental factors on embryonic and fetal development; *e.g., maternal lifestyle, teratogens such as alcohol, drugs, viral infections and radiation*

30–B3.5k describe the physiological or mechanical basis of different reproductive technologies; i.e., conception control, in vitro fertilization, infertility reversal.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–B3.1sts explain that science and technology are developed to meet societal needs and expand human capability **(SEC1)**
- *analyze the use of technology to solve problems of immunological incompatibility between fetus and mother*

30–B3.2sts explain why decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b)**
- *assess the use of technologies such as ultrasound, chorionic villus sampling (CVS), amniocentesis and a fetal heart rate monitor in monitoring fetal development*
- *assess the effects of a conception control technology on population demographics in developed and developing countries*
- *discuss how knowledge of embryonic/fetal development has influenced the value that society places on human life*
- *discuss the societal impact of environmental contaminants (such as polychlorinated biphenyls [PCBs], heavy metals, dioxins and furans) and teratogens.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain how cell differentiation and development in the human organism are regulated by a combination of genetic, endocrine and environmental factors.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

30–B3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design an experiment to investigate hormonal changes during pregnancy* **(IP–NS2, IP–NS3, IP–NS4)**.

Performing and Recording

Students will:

30–B3.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- investigate, using library and electronic sources, the effects of environmental factors on human embryonic and fetal development; *e.g., alcohol, cocaine, cigarette smoke, diet, and prescription and nonprescription drugs* **(PR–SEC1) [ICT C1–4.1]**
- *research the societal impact of technology such as ultrasound, amniocentesis, in vitro fertilization and CVS* **(PR–SEC1) [ICT F3–4.1]**
- *investigate, using library and electronic sources, how embryonic cells communicate during development* **(PR–NS1) [ICT C1–4.1]**.

Analyzing and Interpreting

Students will:

30–B3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- observe the changes during embryo development, using preserved material such as chicken embryos, models or computer simulations, and extrapolate these events to the development of a human **(PR–NS3, AI–NS2) [ICT C6–4.1, C6–4.4]**
- interpret hormonal data from published investigations; *e.g., pregnancy testing* **(AI–NS2) [ICT C7–4.2]**
- *evaluate, from published data, the effectiveness and safety of various reproductive technologies* **(AI–SEC1, AI–SEC2)**
- *analyze the stages of embryonic and fetal development* **(AI–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain how cell differentiation and development in the human organism are regulated by a combination of genetic, endocrine and environmental factors.

Communication and Teamwork

Students will:

30–B3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *develop clear and logical arguments, based on published data, to defend a given decision on the effectiveness and safety of available reproductive technologies* **(CT–SEC3) [ICT C1–4.4]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit C: Cell Division, Genetics and Molecular Biology

Themes: Change and Diversity

Overview: This unit examines the two types of cell division, mitosis and meiosis. Students learn about chromosomal behaviour during cell division and expand their knowledge of chromosomes by studying classical genetics. Classical genetics is further extended to a molecular level by exploring the basic structure of deoxyribonucleic acid (DNA), its role in protein synthesis and the impact of mutation.

This unit builds on:

- Grade 9 Science, Unit A: Biological Diversity

Unit C will require approximately 40% of the time allotted for Biology 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit C but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• measurement	Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4
• probability	Applied Mathematics 30, specific outcomes 2.4, 2.5, 2.6 and 2.7

Focusing Questions: What cellular processes allow for growth and reproduction of an organism? What regulates the transmission of genetic information from one generation to the next? How is DNA responsible for the production of proteins? How has knowledge of the molecular nature of genes and DNA led to new biotechnologies and the treatment of genetic disorders?

General Outcomes: There are three major outcomes in this unit.

Students will:

1. describe the processes of mitosis and meiosis
2. explain the basic rules and processes associated with the transmission of genetic characteristics
3. explain classical genetics at the molecular level.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- cell cycle
- mitosis and meiosis
- chromosome number
- karyotype
- alternation of generations
- Mendel's laws of heredity
- probability
- monohybrid, dihybrid and sex-linked inheritance
- incomplete dominance and codominance
- polygenic and multiple allelic traits
- gene linkage
- model of DNA
- replication
- transcription
- translation
- mutation
- genetic engineering

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General Outcome 1
Students will describe the processes of mitosis and meiosis.

Specific Outcomes for Knowledge

Students will:

30–C1.1k define and explain the significance of chromosome number in somatic and sex cells; i.e., haploidy, diploidy and polyploidy

30–C1.2k explain, in general terms, the events of the cell cycle; i.e., interphase, mitosis and cytokinesis

30–C1.3k describe the process of meiosis (spermatogenesis and oogenesis) and the necessity for the reduction of chromosome number

30–C1.4k compare the processes of mitosis and meiosis

30–C1.5k describe the processes of crossing over and nondisjunction and evaluate their significance to organism inheritance and development

30–C1.6k compare the formation of fraternal and identical offspring in a single birthing event

30–C1.7k describe the diversity of reproductive strategies by comparing the alternation of generations in a range of organisms; *e.g., Daphnia, sea anemone, moss, pine.*

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–C1.1sts explain that science and technology are developed to meet societal needs and expand human capability **(SEC1)**

- *discuss the role of mitosis and biotechnology in regenerating whole, damaged or missing parts of organisms (stem cells, skin tissue)*
- *evaluate how knowledge of cell division or development of nanotechnology might be applied to the regulation of cancerous growth in plants or animals*
- *discuss and assess the impact of research in plant and animal reproduction on our understanding of mitosis and meiosis in humans (cloning, chromosome shortening)*
- *discuss the types and sources of teratogenic compounds found in the environment and the technological means by which they can be removed or controlled to ensure quality of life for future generations.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will describe the processes of mitosis and meiosis.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–C1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *define questions related to mitosis and meiosis, such as chromosome shortening, conditions/stimuli for meiosis, aging and mitosis, cytokinesis* **(IP–NS1)**.

Performing and Recording

Students will:

30–C1.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform a simulation to demonstrate the behaviour of chromosomes during mitosis **(PR–NS3)**
- use a microscope and prepared slides of onion root tip cells to identify the stages of a cell cycle and calculate the duration of each stage **(PR–NS3, AI–NS2)**
- research and compare a range of reproductive strategies in organisms and present them in the form of charts, tables or diagrams; *e.g., binary fission, budding, the sexual and asexual phases of alternation of generations* **(PR–NS1, PR–NS4) [ICT C6–4.3]**
- *prepare microscope slides to demonstrate some stages of mitosis and meiosis* **(PR–NS2, PR–NS3, PR–NS4)**.

Analyzing and Interpreting

Students will:

30–C1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- prepare and interpret models of human karyotypes by using hard-copy or online resources **(AI–NS2)**
- *analyze the similarities and differences of cell division in plants and animals* **(AI–NS2) [ICT C7–4.2]**.

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General Outcome 1
Students will describe the processes of mitosis and meiosis.

Communication and Teamwork

Students will:

30–C1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work collaboratively in the preparation of mitosis slides* **(CT–NS1)**
- *present two contrasting reproductive strategies, emphasizing the differences* **(CT–ST2) [ICT C1–4.4]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the basic rules and processes associated with the transmission of genetic characteristics.

Specific Outcomes for Knowledge

Students will:

30–C2.1k describe the evidence for dominance, segregation and the independent assortment of genes on different chromosomes, as investigated by Mendel

30–C2.2k compare ratios and probabilities of genotypes and phenotypes for dominant and recessive, multiple, incompletely dominant, and codominant alleles

30–C2.3k explain the influence of gene linkage and crossing over on variability

30–C2.4k explain the relationship between variability and the number of genes controlling a trait; *e.g., one pair of genes, as for Rh factor, versus two or more pairs of genes, as for skin colour and height*

30–C2.5k compare the pattern of inheritance produced by genes on the sex chromosomes to that produced by genes on autosomes, as investigated by Morgan and others.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–C2.1sts explain that decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b) [ICT F2–4.2, F3–4.1]**

- *evaluate the needs and interests of society and the role of genetic counselling and technology in the identification and treatment of potentially disabling genetic disorders (phenylketonuria, cystic fibrosis, germ-cell modification)*
- *discuss the contributions of Aboriginal peoples in the development of early plant hybrids*
- *discuss the application of genetic crosses in the development of specific breeds or hybrids (wheat and corn).*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the basic rules and processes associated with the transmission of genetic characteristics.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–C2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues
- design a plan for collecting data to demonstrate human inheritance **(IP–NS2)**.

Performing and Recording

Students will:

30–C2.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information
- perform an experiment to demonstrate inheritance of a trait controlled by a single pair of genes; *e.g., albino corn, Drosophila or Arabidopsis* **(PR–NS2, PR–NS3, PR–NS4)**
- *design and perform an experiment to demonstrate that an environmental factor can cause a change in the expression of genetic information in an organism* **(IP–NS2, IP–NS3, IP–NS4, PR–NS3, PR–NS4, PR–NS5) [ICT F1–4.2]**.

Analyzing and Interpreting

Students will:

30–C2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions
- interpret patterns and trends of inheritance of traits and predict, quantitatively, the probability of inheritance of traits illustrated in monohybrid, dihybrid and sex-linked inheritance, using pedigrees and Punnett squares **[ICT C7–4.2]**
- perform experiments to record and explain predicted phenotypic ratios versus actual counts in genetic crosses to show a relationship between chance and genetic results **(PR–NS2, PR–NS3, PR–NS4, AI–NS3)**
- draw and interpret pedigree charts from data on human single-allele and multiple-allele inheritance patterns; *e.g., hemophilia, blood types* **(PR–NS4, AI–NS2) [ICT C7–4.2]**
- analyze crossover data for a single pair of chromosomes to create a chromosome map showing gene arrangement and relative distance **(AI–NS2) [ICT C7–4.2]**
- *identify limitations of data associated with phenotypic ratios for small populations in which the ratios may not conform with the theoretical ratios expected* **(AI–NS4)**.

Communication and Teamwork

Students will:

30–C2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results
- *work cooperatively with team members to investigate a monohybrid cross (tongue rolling, attached earlobes) and solve problems as they arise* **(CT–NS1, CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain classical genetics at the molecular level.

Specific Outcomes for Knowledge

Students will:

30–C3.1k summarize the historical events that led to the discovery of the structure of the DNA molecule, including the work of Franklin and Watson and Crick

30–C3.2k describe, in general, how genetic information is contained in the sequence of bases in DNA molecules in chromosomes and how the DNA molecules replicate themselves

30–C3.3k describe, in general, how genetic information is transcribed into sequences of bases in RNA molecules and is finally translated into sequences of amino acids in proteins

30–C3.4k explain, in general, how restriction enzymes cut DNA molecules into smaller fragments and how ligases reassemble them

30–C3.5k explain, in general, how cells may be transformed by inserting new DNA sequences into their genomes

30–C3.6k explain how a random change (mutation) in the sequence of bases results in abnormalities or provides a source of genetic variability

30–C3.7k explain how base sequences in nucleic acids contained in the nucleus, mitochondrion and chloroplast give evidence for the relationships among organisms of different species.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–C3.1sts explain that science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F3–4.1]**

- *discuss the implications for society of corporations being able to patent genes, such as the gene for herbicide resistance in canola*
- *assess the concerns and benefits of genetically modified organisms, such as transgenic food organisms or tree cloning for reforestation*

30–C3.2sts explain that scientific research and technological development help achieve a sustainable society, economy and environment **(SEC4a) [ICT F2–4.2, F2–4.8]**

- *discuss the Human Genome Project and the potential of proteomic technologies, in terms of the needs, interests and financial support of society*
- *discuss biotechnology and gene replacement therapy in the treatment of human genetic disorders*
- *assess the impact and value of DNA sequencing on the study of genetic relationships and variations in population ecology*
- *explore the application of nanotechnology and its implications for clinical diagnostics, pharmacology, biological research or proteomic programs.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain classical genetics at the molecular level.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–C3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design an experiment to identify the proteins produced in a cell at a particular point in time or development* **(IP–NS2, IP–NS3, IP–NS4)**.

Performing and Recording

Students will:

30–C3.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- construct models of DNA to demonstrate the general structure and base arrangement **(PR–ST2) [ICT C6–4.4]**
- perform simulations to demonstrate the replication of DNA and the transcription and translation of its information **(PR–NS2, PR–NS4)**
- perform simulations to demonstrate the use of restriction enzymes and ligases **(PR–NS3, PR–NS4)**
- *perform an investigation to extract DNA from cells in green peas, beans, bananas or onions* **(PR–NS2, PR–NS3, PR–NS4, PR–NS5)**
- *research gel electrophoresis techniques and their applications in medical diagnostics and forensics* **(PR–ST1)**.

Analyzing and Interpreting

Students will:

30–C3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze, from published data, relationships between human activities and changes in genetic information that lead to heritable mutations and cancer **(AI–NS2) [ICT C7–4.2]**
- *analyze DNA fingerprints* **(AI–NS2)**
- *compare and contrast homologous DNA sequences to infer ancestry of various species* **(AI–NS2)**.

Communication and Teamwork

Students will:

30–C3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively with team members to investigate the impact of an environmental factor on the expression of a gene and to solve problems as they arise* **(CT–NS1)**
- *debate the advantages and disadvantages of corporate funding and patenting of genetic research results, including Aboriginal and other perspectives of ownership* **(CT–SEC2, CT–SEC3) [ICT C1–4.4]**.

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Unit D: Population and Community Dynamics

Themes: Systems, Equilibrium and Change

Overview: Population change over time can be examined through a study of population genetics (Hardy-Weinberg principle) and population growth. Both of these can be expressed quantitatively. Individual members of populations interact with each other as well as with members of other populations, which can have an impact on the populations involved. Communities are a sum of all the different populations living together. Communities may change over time as a result of natural or artificial events.

This unit builds on:
- Grade 9 Science, Unit A: Biological Diversity
- Biology 20, Unit A: Energy and Matter Exchange in the Biosphere and Unit B: Ecosystems and Population Change

Unit D will require approximately 15% of the time allotted for Biology 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit D but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• graphing and interpreting nonlinear data	Pure Mathematics 10, specific outcome 3.1; Applied Mathematics 10, specific outcomes 3.1 and 3.2; Applied Mathematics 20, specific outcomes 2.3, 2.4 and 2.5
• solving nonlinear equations	Pure Mathematics 10, specific outcome 4.2; Pure Mathematics 20, specific outcomes 2.1, 2.3, 2.4 and 3.1; Applied Mathematics 10, specific outcome 3.3; Applied Mathematics 20, specific outcome 2.1
• measurement	Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: How does one determine if populations are changing over time? In what ways may individual members of a population interact with one another or with members of a different population? What quantitative measures indicate that populations change over time? What role does society play in managing wildlife populations?

General Outcomes: There are three major outcomes in this unit.

Students will:

1. describe a community as a composite of populations in which individuals contribute to a gene pool that can change over time
2. explain the interaction of individuals in a population with one another and with members of other populations
3. explain, in quantitative terms, the change in populations over time.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.
- Hardy-Weinberg principle
- gene pool
- natural selection
- symbiotic relationships and other interactions
- succession
- determiners of population size: natality, mortality, immigration, emigration
- population growth rate and population growth curves
- *r*- and *K*-selected reproductive strategies

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General Outcome 1
Students will describe a community as a composite of populations in which individuals contribute to a gene pool that can change over time.

Specific Outcomes for Knowledge

Students will:

30–D1.1k describe the Hardy-Weinberg principle and explain its significance in population gene-pool stability and nonequilibrium values

30–D1.2k describe the factors that cause the diversity in the gene pool to change; i.e., natural selection, genetic drift, gene flow, nonrandom mating, bottleneck effect, founder effect, migration, mutation

30–D1.3k apply, quantitatively, the Hardy-Weinberg principle to observed and published data to determine allele and genotype frequencies, using the equations $p + q = 1$ and $p^2 + 2pq + q^2 = 1$

30–D1.4k describe the molecular basis of gene-pool change and the significance of these changes over time; i.e., mutations and natural selection *(e.g., drug-resistant bacteria, herbicide-resistant plants).*

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–D1.1sts explain that science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F3–4.1]**

- *discuss the introduction of exotic species into new ecosystems*
- *discuss the development of ecological reserves to preserve gene-pool diversity*
- *assess the bottleneck effect characteristic of small populations, such as in whooping crane and swift fox populations, and suggest strategies to counteract it*
- *investigate the role of gene banks in the preservation of endangered species and genotypes, particularly of plants and animals used in agriculture*
- *assess habitat loss and the responsibility of society to protect the environment for future generations*

30–D1.2sts explain how concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**

- *assess the role and importance of models in ecology, such as the Hardy-Weinberg principle, in explaining scientific phenomena such as changes in gene frequencies.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will describe a community as a composite of populations in which individuals contribute to a gene pool that can change over time.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–D1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *identify a question about the resistance of bacteria to specific antibiotics or about the resistance of plants to specific herbicides* **(IP–NS1)**.

Performing and Recording

Students will:

30–D1.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- design and perform an investigation and/or a computer simulation to demonstrate population growth and gene-pool change **(IP–NS2, IP–NS3, IP–NS4, PR–NS3, PR–NS4, PR–NS5) [ICT C6–4.4, F1–4.2]**
- *research, integrate and synthesize information on a related topic, such as:*
  - *the development and persistence of deleterious genes in gene pools*
  - *the development of bacterial resistance to antibiotics* **(PR–NS1) [ICT C7–4.2]**.

Analyzing and Interpreting

Students will:

30–D1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- calculate and interpret results based on the Hardy-Weinberg principle in problem-solving exercises **(AI–NS6) [ICT C6–4.1]**.

Communication and Teamwork

Students will:

30–D1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate notation and significant digits to show gene frequency and changes in gene frequency over time **(CT–NS2)**.

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General Outcome 2
Students will explain the interaction of individuals in a population with one another and with members of other populations.

Specific Outcomes for Knowledge

Students will:

30–D2.1k describe the basis of species interactions and symbiotic relationships and describe the influence of these interactions on population changes; i.e.,
- predator-prey and producer-consumer relationships
- symbiotic relationships: commensalism, mutualism and parasitism
- interspecific and intraspecific competition

30–D2.2k explain the role of defence mechanisms in predation and competition; *e.g., mimicry, protective coloration, toxins, behaviour*

30–D2.3k explain how mixtures of populations that define communities may change over time or remain as a climax community; i.e., primary succession, secondary succession.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–D2.1sts explain why Canadian society supports scientific research and technological development to facilitate a sustainable society, economy and environment **(SEC4a) [ICT F2–4.2, F2–4.8]**
- *discuss public support for scientific work done on predator-prey relationships as part of wildlife management in national and provincial parks, such as the introduction of wolves*
- *identify examples of wildlife management techniques used by Aboriginal peoples*
- *assess the long-term implications of fire control and prevention on population and ecosystem stability, diversity and productivity*
- *assess the impact of parasites on populations and how this impact could be reduced, considering examples such as liver flukes in elk and lungworms in bighorn sheep.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the interaction of individuals in a population with one another and with members of other populations.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

30–D2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *plan an investigation of species interaction in a national park or wilderness area* **(IP–NS2, IP–NS3)**.

Performing and Recording

Students will:

30–D2.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- design and perform an experiment or a simulation to demonstrate interspecific and intraspecific competition **(IP–NS2, IP–NS3, IP–NS4, PR–NS3, PR–NS4, PR–NS5)**
- design and perform an experiment to demonstrate succession in a micro-environment and record the pattern of succession over time; *e.g., hay infusion* **(IP–NS2, IP–NS3, IP–NS4, PR–NS3, PR–NS4, PR–NS5)**
- perform simulations to investigate relationships between predators and their prey; *e.g., computer simulation, role-playing* **(PR–NS2, PR–NS3, PR–NS4)**.

Analyzing and Interpreting

Students will:

30–D2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- summarize and evaluate a symbiotic relationship **(PR–NS1, AI–NS6)**
- *research and analyze the effects of clearcutting versus selective logging practices on ecosystems* **(PR–SEC1, AI–SEC2)**.

Communication and Teamwork

Students will:

30–D2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *research and present practical solutions for reducing the impact of highway fencing on animals in Banff and Jasper National Parks* **(CT–SEC1, CT–SEC2) [ICT C1–4.4]**
- *develop, present and defend a position on whether organisms should be deliberately introduced into new environments* **(CT–SEC1, CT–SEC2) [ICT C1–4.4, C7–4.2]**
- *research and present characteristics of interrelationships between organisms for analysis by classmates* **(CT–SEC1, CT–SEC2) [ICT C1–4.4, C7–4.2]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain, in quantitative terms, the change in populations over time.

Specific Outcomes for Knowledge

Students will:

30–D3.1k describe and explain, quantitatively, factors that influence population growth; i.e.,
- mortality, natality, immigration, emigration
- change in population size, ΔN = [natality + immigration] – [mortality + emigration]

30–D3.2k describe the growth of populations in terms of the mathematical relationship among carrying capacity, biotic potential, environmental resistance and the number of individuals in the population; i.e.,
- growth rate, $gr = \frac{\Delta N}{\Delta t}$, where ΔN is the change in number of individuals in a population and Δt is change in time
- per capita growth rate, $cgr = \frac{\Delta N}{N}$, where ΔN is the change in number of individuals in a population relative to N, the original number of individuals
- population density, $D_p = \frac{N}{A}$, or $D_p = \frac{N}{V}$, where N is the number of individuals in a given space, A is the area, and V is the volume

30–D3.3k explain the different population growth patterns; i.e.,
- logistic growth pattern (S-shaped curve) and exponential growth pattern (J-shaped curve)
- open and closed populations

30–D3.4k describe the characteristics and reproductive strategies of *r*-selected and *K*-selected organisms.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–D3.1sts explain how concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**
- *develop appropriate investigative strategies, such as a risk-benefit analysis or cost-benefit analysis, for analyzing biological issues*
- *compare the growth of the human population with that of populations of other species.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain, in quantitative terms, the change in populations over time.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–D3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *identify questions about factors that affect population growth rates* **(IP–NS1)**.

Performing and Recording

Students will:

30–D3.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- design and perform an experiment or a computer simulation to demonstrate the effect of environmental factors on population growth rate **(IP–NS2, IP–NS3, IP–NS4, PR–NS3, PR–NS4) [ICT C6–4.4, F1–4.2]**
- *monitor a paramecium population over time, using a microscope and a grid slide* **(PR–NS2, PR–NS3, PR–NS4, PR–NS5)**
- *research zebra mussel population growth in the Great Lakes* **(PR–NS1, PR–NS4)**
- *research the impact of introduced trout species on populations of native bull trout (Salvelinus confluentus) in Alberta's lakes and streams* **(PR–NS1)**.

Analyzing and Interpreting

Students will:

30–D3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- graph and interpret population growth of *r*-selected and *K*-selected organisms **(AI–NS2) [ICT C7–4.2]**
- calculate and interpret change in population size, growth rate, per capita growth rate and population density **(AI–NS2, AI–NS3, AI–NS4)**
- *compare and evaluate human population growth rates in various countries* **(AI–NS2) [ICT C7–4.2]**
- *demonstrate and assess the effect of environmental factors (biotic potential and environmental resistance) on population growth curves* **(AI–NS2, AI–NS6)**
- *calculate population growth rate under ideal conditions, given specific parameters* **(AI–NS3, AI–NS4)**
- *state a generalization based on data for the growth of a closed population* **(AI–NS2, AI–NS6)**
- *explain limitations in identifying changes in populations and explain how traditional knowledge can contribute to knowledge about changes* **(AI–NS4)**.

Communication and Teamwork

Students will:

30–D3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *develop, present and defend a position on Earth's carrying capacity of Homo sapiens* **(CT–SEC1, CT–SEC2, CT–SEC3) [ICT C1–4.4, C7–4.2]**.

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Effective September 2007, pages 11 to 40 have been **removed** and **replaced** with the **new provincially implemented** Biology 20 (2007) Program of Studies.

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CHEMISTRY 20–30

Provincial Implementation Schedule
Chemistry 20 September 2007
Chemistry 30 September 2008

Implementation prior to these dates is **not** approved.

PROGRAM RATIONALE AND PHILOSOPHY

Science programs provide opportunities for students to develop the knowledge, skills and attitudes they need to become productive and responsible members of society. The programs also allow students to explore interests and prepare for further education and careers. Students graduating from Alberta schools require the scientific and related technological knowledge and skills that will enable them to understand and interpret their world. They also need to develop attitudes that will motivate them to use their knowledge and skills in a responsible manner.

To become scientifically literate, students need to develop a knowledge of science and its relationship to technologies and society. They also need to develop the broad-based skills required to identify and analyze problems; to explore and test solutions; and to seek, interpret and evaluate information. To ensure relevance to students as well as to societal needs, a science program must present science in a meaningful context—providing opportunities for students to explore the process of science, its applications and implications, and to examine related technological problems and issues. By doing so, students become aware of the role of science in responding to social and cultural change and in meeting needs for a sustainable environment, economy and society.

Program Vision

The secondary science program is guided by the vision that all students, regardless of gender or cultural background, are given the opportunity to develop scientific literacy. The goal of scientific literacy is to develop in students the science-related knowledge, skills and attitudes that they need to solve problems and make decisions and, at the same time, to help students become lifelong learners who maintain their sense of wonder about the world around them.

Diverse learning experiences within the science program provide students with opportunities to explore, analyze and appreciate the interrelationships among science, technology, society and the environment and to develop understandings that will affect their personal lives, their careers and their futures.

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Goals

The following goals for Canadian science education, developed in the *Common Framework of Science Learning Outcomes K to 12: Pan-Canadian Protocol for Collaboration on School Curriculum* (1997), are addressed through the Alberta science program. Science education will:

- encourage students at all grade levels to develop a critical sense of wonder and curiosity about scientific and technological endeavours
- enable students to use science and technology to acquire new knowledge and solve problems so that they may improve the quality of their lives and the lives of others
- prepare students to critically address science-related societal, economic, ethical and environmental issues
- provide students with a foundation in science that creates opportunities for them to pursue progressively higher levels of study, prepares them for science-related occupations and engages them in science-related hobbies appropriate to their interests and abilities
- develop in students of varying aptitudes and interests a knowledge of the wide spectrum of careers related to science, technology and the environment.

Aboriginal Perspectives

Courses in the senior high school sciences incorporate Aboriginal perspectives in order to develop, in all students, an appreciation of the cultural diversity and achievements of First Nations, Métis and Inuit (FNMI) peoples. These courses are designed to:

- acknowledge the contributions of Aboriginal peoples to understandings of the natural world
- support relational thinking by integrating learning from various disciplines of science
- develop the concept of humankind's connectivity to the natural world and foster an appreciation for the importance of caring for the environment
- foster the development of positive attitudes by providing experiences that encourage all students to feel confident about their ability to succeed in science.

Information and Communication Technology (ICT)

Selected curriculum outcomes from Alberta Education's Information and Communication Technology (ICT) Program of Studies are infused throughout the 20-level and 30-level sciences so that students will develop a broad perspective on the nature of technology, learn how to use and apply a variety of technologies, and consider the impact of ICT on individuals and society. The infusion of ICT outcomes supports and reinforces the understandings and abilities that students are expected to develop within Foundation 3 (Science, Technology and Society) and Foundation 4 (Skills) of these courses. Effective, efficient and ethical application of ICT outcomes contributes to the program vision.

Infusion of ICT outcomes provides learning opportunities for students to:

- understand the nature of technology and apply terminology appropriately
- use equipment carefully and share limited ICT resources
- use technology in an ethical manner, including respecting the ownership of information and digital resources and citing electronic sources
- use technology safely, including applying ergonomic principles and appropriate safety procedures
- use the Internet safely, including protecting personal information and avoiding contact with strangers
- use technology appropriately, including following communication etiquette and respecting the privacy of others.

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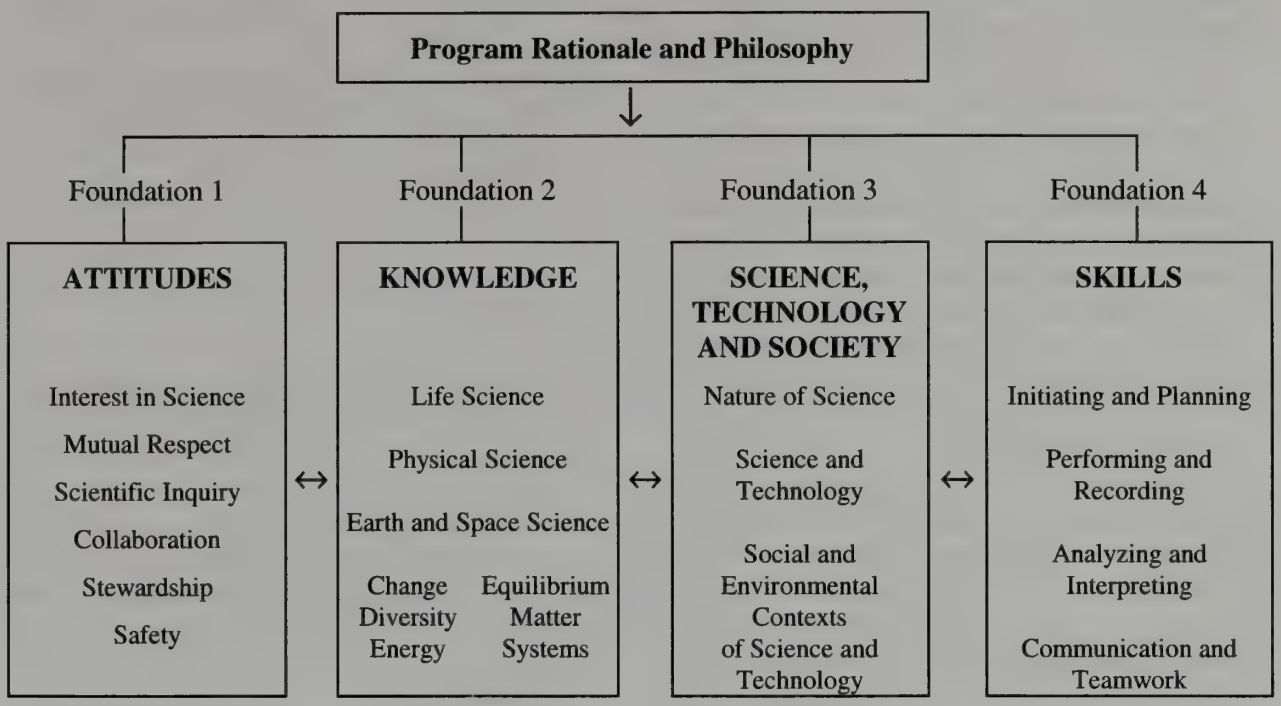
PROGRAM FOUNDATIONS

To support the development of scientific literacy, a science program must provide learning experiences that address critical aspects of science and its application. These foundations provide a general direction for the program and identify the major components of its structure.



Foundation 1
Attitudes—*Students will be encouraged to* develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society and the environment.

Foundation 2
Knowledge—*Students will* construct knowledge and understandings of concepts in life science, physical science and Earth and space science, and apply these understandings to interpret, integrate and extend their knowledge.

Foundation 3
Science, Technology and Society (STS)—*Students will* develop an understanding of the nature of science and technology, the relationships between science and technology, and the social and environmental contexts of science and technology.

Foundation 4
Skills—*Students will* develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively and for making informed decisions.

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Foundation 1: Attitudes

Foundation 1 is concerned with the generalized aspects of behaviour that are commonly referred to as attitudes. Attitude outcomes are of a different form than outcomes for skills and knowledge: they are exhibited in a different way, and they are rooted more deeply in the experiences that students bring to school. Attitude development is a lifelong process that involves the home, the school, the community and society at large. Attitudes are best shown not by the events of a particular moment but by the pattern of behaviours over time. Development of positive attitudes plays an important role in student growth by interacting with students' intellectual development and by creating a readiness for responsible application of what is learned.

Interest in Science

Students will be encouraged to develop enthusiasm and continuing interest in the study of science.

Mutual Respect

Students will be encouraged to appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds.

Scientific Inquiry

Students will be encouraged to develop attitudes that support active inquiry, problem solving and decision making.

Collaboration

Students will be encouraged to develop attitudes that support collaborative activity.

Stewardship

Students will be encouraged to develop responsibility in the application of science and technology in relation to society and the natural environment.

Safety

Students will be encouraged to demonstrate a concern for safety in science and technology contexts.

Foundation 2: Knowledge

Foundation 2 focuses on the subject matter of science, including the laws, theories, models, concepts and principles that are essential to an understanding of each science area. For organizational purposes, this foundation is framed using widely accepted science disciplines.

Life Science

Life science deals with the growth and interactions of life forms within their environments in ways that reflect their uniqueness, diversity, genetic continuity and changing nature. Life science includes such fields of study as ecosystems, biological diversity, organisms, cells, biochemistry, genetic engineering and biotechnology.

Physical Science

Physical science, which encompasses chemistry and physics, deals with matter, energy and forces. Matter has structure, and there are interactions among its components. Energy links matter to gravitational, electromagnetic and nuclear forces in the universe. Physical science also addresses the conservation laws of mass and energy, momentum and charge.

Earth and Space Science

Earth and space science brings global and universal perspectives to student knowledge. The planet Earth exhibits form, structure and patterns of change, as does the surrounding solar system and the physical universe beyond it. Earth and space science includes such fields of study as geology, meteorology and astronomy.

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Themes are the major ideas of science and technology that transcend discipline boundaries and demonstrate unity among the natural sciences. Six themes have been identified for the senior high school sciences program.

Change
Students will develop an understanding of:

How all natural entities are modified over time, how the direction of change might be predicted and, in some instances, how change can be controlled.

Diversity
Students will develop an understanding of:

The array of living and nonliving forms of matter and the procedures used to understand, classify and distinguish these forms of matter on the basis of recurring patterns.

Energy
Students will develop an understanding of:

The capacity for doing work that drives much of what takes place in the universe through its variety of interconvertible forms.

Equilibrium
Students will develop an understanding of:

The state in which opposing forces or processes balance in a static or dynamic way.

Matter
Students will develop an understanding of:

The constituent parts, and the variety of states, of the material in the physical world.

Systems
Students will develop an understanding of:

The interrelated groups of things or events that can be defined by their boundaries and, in some instances, by their inputs and outputs.

Foundation 3: Science, Technology and Society (STS)

Foundation 3 is concerned with understanding the scope and character of science, its connections to technology and the social context in which it is developed. The following is a brief introduction to the major ideas underlying this component of the program.

Nature of Science

Science provides an ordered way of learning about the nature of things, based on observation and evidence. Through science, we explore our environment, gather knowledge and develop ideas that help us interpret and explain what we see. Scientific activity provides a conceptual and theoretical base that is used in predicting, interpreting and explaining natural and technological phenomena. Science is driven by a combination of specific knowledge, theory, observation and experimentation. Science-based ideas are continually being tested, modified and improved as new knowledge and explanations supersede existing knowledge and explanations.

Science and Technology

Technology is concerned with solving practical problems that arise from human needs. Historically, the development of technology has been strongly linked to the development of science, with each making contributions to the other. While there are important relationships and interdependencies, there are also important differences. Whereas the focus of science is on the development and verification of knowledge, the focus of technology is on the development of solutions, involving devices and systems that meet a given need within the constraints of a problem. The test of scientific knowledge is that it helps us explain, interpret and predict; the test of technology is that it works—it enables us to achieve a given purpose.

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Social and Environmental Contexts

The history of science shows that scientific development takes place within a social context. Many examples can be used to show that cultural and intellectual traditions have influenced the focus and methodologies of science, and that science in turn has influenced the wider world of ideas.

Today, research is often driven by societal and environmental needs and issues. As technological solutions have emerged from previous research, many of the new technologies have given rise to complex social and environmental issues. Increasingly, these issues are becoming part of the political agenda. The potential of science to inform and empower decision making by individuals, communities and society is central to scientific literacy in a democratic society.

Foundation 4: Skills

Foundation 4 is concerned with the skills that students develop in answering questions, solving problems and making decisions. While these skills are not unique to science, they play an important role in the development of scientific understandings and in the application of science and technology to new situations. Four broad skill areas are outlined in the secondary science program. Each skill area is developed at each level with increasing scope and complexity of application.

Initiating and Planning

These are the skills of questioning, identifying problems and developing preliminary ideas and plans.

Performing and Recording

These are the skills of carrying out a plan of action that include gathering evidence by observation and, in most cases, manipulating materials and equipment.

Analyzing and Interpreting

These are the skills of examining information and evidence; of processing and presenting data so that they can be interpreted; and of interpreting, evaluating and applying the results.

Communication and Teamwork

In science, as in other areas, communication skills are essential at every stage during which ideas are being developed, tested, interpreted, debated and agreed upon. Teamwork skills are also important, as the development and application of science ideas are collaborative processes both in society and in the classroom.

PROGRAM ORGANIZATION

Attitude Outcomes

A listing of Attitude outcomes is included at the beginning of each of the 20-level and 30-level courses in the senior high school sciences program. These specific outcomes are to be developed throughout the particular course in conjunction with the specific outcomes for Knowledge, STS and Skills listed within each unit of study.

Units of Study

In the senior high school sciences program, four units of study are outlined for each course. Each unit in the 20-level and 30-level courses includes the following components.

Themes

Themes are the major ideas of science that transcend topics of study.

Overview

The overview introduces the contents of the unit and suggests an approach to unit development.

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Links to Mathematics

This section lists topics from mathematics programs of study that are related to the science content of the unit.

Focusing Questions

These questions frame a context for introducing the unit and suggest a focus for investigative activities and application of ideas by students.

Key Concepts

Key concepts identify major ideas to be developed in the unit. Some of the concepts may be addressed in additional units of the same course, as well as in other courses. The intended scope of treatment of these concepts is indicated by the outcomes.

Outcomes

Two levels of outcomes are provided in each unit:

- General Outcomes: These are the major outcomes in the unit that students are to demonstrate over the course of their learning.
- Specific Outcomes: These are detailed outcomes that delineate the scope of each general outcome and the unit. Specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills are identified.

The outcomes are numbered for the purpose of referencing. This numbering is not intended to imply a fixed instructional sequence.

Examples

Many of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

STS Emphases

The specific outcomes for Science, Technology and Society (STS) and Skills for each general outcome in a unit include one of the following emphases:

- Nature of Science
- Science and Technology
- Social and Environmental Contexts

The STS emphases provide opportunities for students to develop related concepts and skills as outlined on pages 8 to 10.

Additional Links

Links to the STS emphasis frameworks (pages 8 to 10) are shown in **boldface** and (in parentheses) after specific outcomes for STS and after specific outcomes or examples for Skills. Links to the Division 4 ICT curriculum (pages 11 to 13) are shown in **boldface** and [in brackets] after some of the specific outcomes and examples for STS and Skills. The STS and ICT links indicate that the concept or skill from the STS emphasis framework or the Division 4 ICT outcome has been addressed in the specific outcome or example.

Note: The listing of STS and ICT links is not exhaustive; other links may exist.

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Framework for Developing a Nature of Science Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on how scientific knowledge is developed)

Students will develop an understanding that:

- the goal of science is knowledge about the natural world **(NS1)**
- scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**
- scientific knowledge results from peer review and replication of the research of others **(NS3)**
- scientific knowledge is subject to change as new evidence becomes apparent and as laws and theories are tested and subsequently revised, reinforced or rejected **(NS4)**
- the process of scientific investigation includes **(NS5)**:
  - identifying the theoretical basis of the investigation **(NS5a)**
  - defining and delimiting, clearly, research questions or ideas to be tested **(NS5b)**
  - designing the investigation **(NS5c)**
  - evaluating and selecting means to collect and record evidence **(NS5d)**
  - carrying out the investigation **(NS5e)**
  - analyzing the evidence and providing explanations based upon scientific theories and concepts **(NS5f)**
- scientific paradigms are conceptual inventions that help organize, interpret and explain findings **(NS6)**
  - Concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**
  - Conventions of mathematics, nomenclature and notation provide a basis for organizing and communicating scientific theory, relationships and concepts; e.g., chemical symbols **(NS6b)**
  - Scientific language is precise, and specific terms may be used in each field of study **(NS6c)**
- scientific inquiry is limited to certain questions **(NS7)**

Skills (focus on scientific inquiry)

Initiating and Planning **(IP–NS)**

Students will:

- identify, define and delimit questions to investigate **(IP–NS1)**
- design an experiment, identifying and controlling major variables **(IP–NS2)**
- state a prediction and a hypothesis based on available evidence or background information or on a theory **(IP–NS3)**
- evaluate and select appropriate procedures, including appropriate sampling procedures, and instruments for collecting evidence and information **(IP–NS4)**

Performing and Recording **(PR–NS)**

Students will:

- research, integrate and synthesize information from various print and electronic sources regarding a scientific question **(PR–NS1)**
- select and use appropriate instruments for collecting data effectively, safely and accurately **(PR–NS2)**
- carry out procedures, controlling the major variables, and adapt or extend procedures where required **(PR–NS3)**
- compile and organize findings and data by hand or computer, using appropriate formats such as diagrams, flowcharts, tables and graphs **(PR–NS4)**
- apply Workplace Hazardous Materials Information System (WHMIS) standards to handle and dispose of materials **(PR–NS5)**

Analyzing and Interpreting **(AI–NS)**

Students will:

- apply appropriate terminology, classification systems and nomenclature used in the sciences **(AI–NS1)**
- interpret patterns and trends in data and predict the value of a variable by interpolating or extrapolating from graphical data or from a line of best fit **(AI–NS2)**
- estimate and calculate the value of variables, compare theoretical and empirical values, and account for discrepancies **(AI–NS3)**
- identify limitations of data or measurements; explain sources of error; and evaluate the relevance, reliability and adequacy of data and data collection methods **(AI–NS4)**
- identify new questions or problems that arise from what was learned **(AI–NS5)**
- state a conclusion, based on data obtained from investigations, and explain how evidence gathered supports or refutes a hypothesis, prediction or theory **(AI–NS6)**

Communication and Teamwork **(CT–NS)**

Students will:

- work collaboratively to develop and carry out investigations **(CT–NS1)**
- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**
- evaluate individual and group processes used in planning and carrying out investigative tasks **(CT–NS3)**

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Framework for Developing a Science and Technology Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on the interrelationship of science and technology)

Students will develop an understanding that:

- the goal of technology is to provide solutions to practical problems **(ST1)**
- technological development may involve the creation of prototypes, the testing of prototypes and the application of knowledge from related scientific and interdisciplinary fields **(ST2)**
- technological problems often require multiple solutions that involve different designs, materials and processes and that have both intended and unintended consequences **(ST3)**
- scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4)**
- the process for technological development includes **(ST5)**:
  - defining and delimiting, clearly, the problems to be solved and establishing criteria to assess the technological solution **(ST5a)**
  - identifying the constraints, the benefits and the drawbacks **(ST5b)**
  - developing designs and prototypes **(ST5c)**
  - testing and evaluating designs and prototypes on the basis of established criteria **(ST5d)**
- the products of technology are devices, systems and processes that meet given needs; however, these products cannot solve all problems **(ST6)**
- the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7)**

Skills (focus on problem solving)

Initiating and Planning **(IP–ST)**
Students will:

- identify questions to investigate arising from practical problems **(IP–ST1)**
- propose and assess alternative solutions to a given practical problem, select one and develop a plan **(IP–ST2)**
- evaluate and select appropriate procedures and instruments for collecting data and information and for solving problems **(IP–ST3)**

Performing and Recording **(PR–ST)**
Students will:

- research, integrate and synthesize information from various print and electronic sources relevant to a practical problem **(PR–ST1)**
- construct and test a prototype device or system and troubleshoot problems as they arise **(PR–ST2)**
- select and use tools, apparatus and materials safely **(PR–ST3)**

Analyzing and Interpreting **(AI–ST)**
Students will:

- evaluate designs and prototypes on the basis of self-developed criteria; e.g., function, reliability, cost, safety, efficient use of materials, impact on the environment **(AI–ST1)**
- analyze alternative solutions to a given problem, identify potential strengths and weaknesses of each and recommend an approach to solving the problem, based on findings **(AI–ST2)**
- solve problems by selecting appropriate technology to perform manipulations and calculations **(AI–ST3)**
- identify new questions and problems that arise from what was learned and evaluate potential applications of findings **(AI–ST4)**

Communication and Teamwork **(CT–ST)**
Students will:

- work collaboratively to test a prototype device or system and troubleshoot problems as they arise **(CT–ST1)**
- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–ST2)**
- evaluate individual and group processes used in planning and carrying out problem-solving tasks **(CT–ST3)**

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Framework for Developing a Social and Environmental Contexts Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on issues related to the application of science and technology)

Students will develop an understanding that:

- science and technology are developed to meet societal needs and expand human capability **(SEC1)**
- science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2)**
- science and technology have both intended and unintended consequences for humans and the environment **(SEC3)**
- society provides direction for scientific and technological development **(SEC4)**
  - Canadian society supports scientific research and technological development to facilitate a sustainable society, economy and environment **(SEC4a)**
  - Decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b)**
  - Society supports scientific and technological development by recognizing accomplishments, publishing and disseminating results and providing financial support **(SEC4c)**
- scientific and technological activity may arise from, and give rise to, such personal and social values as accuracy, honesty, perseverance, tolerance, open-mindedness, critical-mindedness, creativity and curiosity **(SEC5)**
- science and technology provide opportunities for a diversity of careers based on post-secondary studies, for the pursuit of hobbies and interests, and for lifelong learning **(SEC6)**

Skills (focus on applying science to inform decision-making processes)

Initiating and Planning **(IP–SEC)**

Students will:

- identify questions to investigate that arise from issues related to the application of science and technology **(IP–SEC1)**
- plan complex searches for information, using a wide variety of electronic and print sources **(IP–SEC2)**
- assess and develop appropriate processes for collecting relevant data and information about science-and-technology-related issues **(IP–SEC3)**

Performing and Recording **(PR–SEC)**

Students will:

- research, integrate and synthesize information from various print and electronic sources relevant to a given question, problem or issue **(PR–SEC1)**
- select information and gather evidence from appropriate sources and evaluate search strategies **(PR–SEC2)**

Analyzing and Interpreting **(AI–SEC)**

Students will:

- apply given criteria for evaluating evidence and assess the authority, reliability, scientific accuracy and validity of sources of information **(AI–SEC1)**
- apply a variety of perspectives in assessing the risks and benefits of scientific and technological developments **(AI–SEC2)**
- assess potential decisions and recommend the best one, based on findings **(AI–SEC3)**
- identify new questions that arise and evaluate, from a variety of perspectives, potential implications of findings **(AI–SEC4)**

Communication and Teamwork **(CT–SEC)**

Students will:

- work collaboratively to investigate a science-and-technology-related issue **(CT–SEC1)**
- communicate in a persuasive and an engaging manner, using appropriate multimedia forms, to further understand a complex science-and-technology-related issue **(CT–SEC2)**
- make clear and logical arguments to defend a given decision on an issue, based on findings **(CT–SEC3)**
- evaluate individual and group processes used in investigating an issue and in evaluating alternative decisions **(CT–SEC4)**

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Division 4 ICT Outcomes

Category: Communicating, Inquiring, Decision Making and Problem Solving

General Outcomes	Specific Outcomes
C1 **Students will access, use and communicate information from a variety of technologies.**	C1 4.1 plan and perform complex searches, using more than one electronic source 4.2 select information from appropriate sources, including primary and secondary sources 4.3 evaluate and explain the advantages and disadvantages of various search strategies 4.4 communicate in a persuasive and engaging manner, through appropriate forms, such as speeches, letters, reports and multimedia presentations, applying information technologies for context, audience and purpose that extend and communicate understanding of complex issues
C2 **Students will seek alternative viewpoints, using information technologies.**	C2 4.1 consult a wide variety of sources that reflect varied viewpoints on particular topics 4.2 evaluate the validity of gathered viewpoints against other sources
C3 **Students will critically assess information accessed through the use of a variety of technologies.**	C3 4.1 assess the authority, reliability and validity of electronically accessed information 4.2 demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic
C4 **Students will use organizational processes and tools to manage inquiry.**	C4 4.1 use calendars, time management or project management software to assist in conducting an inquiry
C5 **Students will use technology to aid collaboration during inquiry.**	C5 4.1 use telecommunications to pose critical questions to experts 4.2 participate in a variety of electronic group formats
C6 **Students will use technology to investigate and/or solve problems.**	C6 4.1 investigate and solve problems of prediction, calculation and inference 4.2 investigate and solve problems of organization and manipulation of information 4.3 manipulate data by using charting and graphing technologies in order to test inferences and probabilities 4.4 generate new understandings of problematic situations by using some form of technology to facilitate the process 4.5 evaluate the appropriateness of the technology used to investigate or solve a problem
C7 **Students will use electronic research techniques to construct personal knowledge and meaning.**	C7 4.1 use appropriate strategies to locate information to meet personal needs 4.2 analyze and synthesize information to determine patterns and links among ideas 4.3 use appropriate presentation software to demonstrate personal understandings

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Division 4 ICT Outcomes (continued)

Category: Foundational Operations, Knowledge and Concepts

General Outcomes	Specific Outcomes
F1 **Students will demonstrate an understanding of the nature of technology.**	**F1** 4.1 assess the strengths and weaknesses of computer simulations in relation to real-world problems 4.2 solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments 4.3 apply terminology appropriate to technology in all forms of communication 4.4 demonstrate an understanding of the general concepts of computer programming and the algorithms that enable technological devices to perform operations and solve problems
F2 **Students will understand the role of technology as it applies to self, work and society.**	**F2** 4.1 use technology outside formal classroom settings 4.2 analyze how technological innovations and creativity affect the economy 4.3 demonstrate an understanding of new and emerging communication systems 4.4 evaluate possible potential for emerging technologies 4.5 demonstrate conservation measures when using technology 4.6 demonstrate an understanding of the basic principles and issues of e-commerce, including such topics as security and privacy, marketing, and implications for governments, businesses and consumers alike 4.7 use current, reliable information sources from around the world 4.8 analyze and assess the impact of technology on the global community
F3 **Students will demonstrate a moral and ethical approach to the use of technology.**	**F3** 4.1 demonstrate an understanding of how changes in technology can benefit or harm society 4.2 record relevant data for acknowledging sources of information, and cite sources correctly 4.3 respect ownership and integrity of information
F4 **Students will become discerning consumers of mass media and electronic information.**	**F4** 4.1 discriminate between style and content in a presentation 4.2 evaluate the influence and results of digital manipulation on our perceptions 4.3 identify and analyze a variety of factors that affect the authenticity of information derived from mass media and electronic communication
F5 **Students will practise the concepts of ergonomics and safety when using technology.**	**F5** 4.1 assess new physical environments with respect to ergonomics 4.2 identify safety regulations specific to the technology being used
F6 **Students will demonstrate a basic understanding of the operating skills required in a variety of technologies.**	**F6** 4.1 continue to demonstrate the outcomes addressed within the previous divisions. Students interested in pursuing advanced study in such areas as electronics, programming, computer-aided design and drafting (CADD), robotics and other industrial applications of technology will find opportunities in Career and Technology Studies (CTS) courses

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Division 4 ICT Outcomes (continued)

Category: Processes for Productivity

General Outcomes	Specific Outcomes
P1 **Students will compose, revise and edit text.**	P1 4.1 continue to demonstrate the outcomes achieved in prior grades and course subjects
P2 **Students will organize and manipulate data.**	P2 4.1 manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets
P3 **Students will communicate through multimedia.**	P3 4.1 select and use, independently, multimedia capabilities for presentations in various subject areas 4.2 support communication with appropriate images, sounds and music 4.3 apply general principles of graphic layout and design to a document in process
P4 **Students will integrate various applications.**	P4 4.1 integrate a variety of visual and audio information into a document to create a message targeted for a specific audience 4.2 apply principles of graphic design to enhance meaning and audience appeal 4.3 use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text
P5 **Students will navigate and create hyperlinked resources.**	P5 4.1 create multiple-link documents appropriate to the content of a particular topic 4.2 post multiple-link pages on the World Wide Web or on a local or wide area network
P6 **Students will use communication technology to interact with others.**	P6 4.1 select and use the appropriate technologies to communicate effectively with a targeted audience

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CHEMISTRY 20

Chemistry 20 consists of four units of study:

A. The Diversity of Matter and Chemical Bonding
B. Forms of Matter: Gases
C. Matter as Solutions, Acids and Bases
D. Quantitative Relationships in Chemical Changes

Attitude Outcomes

Students will be encouraged to develop positive attitudes that support the responsible acquisition and application of knowledge related to science and technology. The following attitude outcomes are to be developed throughout Chemistry 20, in conjunction with the specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills in each unit.

Interest in Science

Students will be encouraged to:
show interest in science-related questions and issues and confidently pursue personal interests and career possibilities within science-related fields; *e.g.,*

- *appreciate how scientific problem solving and new technologies are related*
- *appreciate the usefulness of models and theories in helping explain the structure and behaviour of matter*
- *investigate careers in fields such as food science, engineering, laboratory technology, environmental chemistry, agriculture, water treatment and forensic science*
- *develop an interest in the role of chemistry in daily life*
- *develop a questioning attitude and a desire to understand more about matter*
- *express interest in science and technology topics not directly related to their formal studies*
- *develop an awareness of the relationship between chemical principles and applications of chemistry*
- *identify industrial, commercial and household processes and products and associated careers that require a knowledge of quantitative analysis.*

Mutual Respect

Students will be encouraged to:
appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds; *e.g.,*

- *use a multiperspective approach, considering scientific, technological, economic, cultural, political and environmental factors when formulating conclusions, solving problems or making decisions on an STS issue*
- *recognize that theories develop as a result of the sharing of ideas by many scientists*
- *trace, from a historical perspective, how the observations and experimental work of many individuals led to modern understandings of matter*
- *value traditional knowledge of common solutions and substances*
- *research the role of chemistry in the International Space Station project*
- *investigate how early peoples developed recipes for common foods, cleaners and remedies*
- *recognize that the scientific approach is one of many ways of viewing the universe*
- *recognize the contributions of various peoples and cultures in advancing understanding and applications of chemistry*
- *recognize the research contributions of both men and women*
- *recognize the research contributions of Canadians.*

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Scientific Inquiry

Students will be encouraged to:
seek and apply evidence when evaluating alternative approaches to investigations, problems and issues; *e.g.,*

- *develop curiosity about the nature of chemistry*
- *tolerate the uncertainty involved in providing explanations and theoretical definitions*
- *appreciate the limited nature of evidence when interpreting observed phenomena*
- *appreciate that scientific evidence is the foundation for generalizations and explanations about chemistry*
- *value the role of precise observation and careful experimentation in learning about chemistry.*

Collaboration

Students will be encouraged to:
work collaboratively in planning and carrying out investigations and in generating and evaluating ideas; *e.g.,*

- *assume a variety of roles within a group, as required*
- *accept responsibility for any task that helps the group complete an activity*
- *evaluate the ideas of others objectively*
- *seek the points of view of others and consider a multitude of perspectives.*

Stewardship

Students will be encouraged to:
demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment; *e.g.,*

- *evaluate, willingly, the impact of their own choices or the choices scientists make when they carry out an investigation*
- *remain critical-minded regarding the short- and long-term consequences of human actions*
- *consider a variety of perspectives when addressing issues, weighing scientific, technological, economic, political and ecological factors*
- *develop an awareness that the application of technology has risks and benefits*
- *evaluate the contributions of technological innovations to quality of life and care of the environment.*

Safety

Students will be encouraged to:
show concern for safety in planning, carrying out and reviewing activities, referring to the Workplace Hazardous Materials Information System (WHMIS) and consumer product labelling information; *e.g.,*

- *treat equipment with respect and manipulate materials carefully*
- *value the need for safe handling and storage of chemicals*
- *recognize the significant role that chemical researchers and the chemical industry play in identifying risks and developing guidelines for safe exposure*
- *use minimal quantities of chemicals when performing experiments*
- *keep the work station uncluttered, with only appropriate laboratory materials present*
- *assume responsibility for the safety of all those who share a common working environment*
- *clean up after an activity and dispose of materials in a safe place according to safety guidelines.*

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Unit A: The Diversity of Matter and Chemical Bonding

Themes: Diversity and Matter

Overview: Concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations. The major focus of this unit is to relate theories about bonding to the properties of matter and to develop explanations and descriptions of structure and bonding through scientific models. Students learn about the diversity of matter through the investigation of ionic compounds and molecular substances.

This unit builds on:
- Grade 9 Science, Unit B: Matter and Chemical Change
- Science 10, Unit A: Energy and Matter in Chemical Change

This unit provides a background for:
- Chemistry 30, Unit A: Thermochemical Changes, Unit B: Electrochemical Changes and Unit C: Chemical Changes of Organic Compounds

Unit A will require approximately 20% of the time allotted for Chemistry 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit A but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• graphing and interpreting data	Pure Mathematics 10, specific outcome 3.1
• linear equations	Pure Mathematics 10, specific outcome 2.7; Applied Mathematics 10, specific outcomes 1.2, 1.3 and 5.1
• measurement	Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: Why do some substances dissolve easily, whereas others do not? Why do different substances have different melting and boiling points and enthalpies of fusion and vaporization? How can models increase understanding of bonding?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of ionic compounds
2. describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of molecular substances.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- chemical bond
- ionic bond
- covalent bond
- electronegativity
- polarity
- valence electron
- intramolecular and intermolecular forces
- hydrogen bond
- electron dot diagrams
- Lewis structures
- valence-shell electron-pair repulsion (VSEPR) theory

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General Outcome 1
Students will describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of ionic compounds.

Specific Outcomes for Knowledge

Students will:

20–A1.1k recall principles for assigning names to ionic compounds

20–A1.2k explain why formulas for ionic compounds refer to the simplest whole-number ratio of ions that result in a net charge of zero

20–A1.3k define valence electron, electronegativity, ionic bond and intramolecular force

20–A1.4k use the periodic table and electron dot diagrams to support and explain ionic bonding theory

20–A1.5k explain how an ionic bond results from the simultaneous attraction of oppositely charged ions

20–A1.6k explain that ionic compounds form lattices and that these structures relate to the compounds' properties; *e.g., melting point, solubility, reactivity.*

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–A1.1sts explain that the goal of science is knowledge about the natural world **(NS1)**

- *identify everyday processes and products in which ionic compounds are significant, such as in the composition of household products and foods and in life processes*

20–A1.2sts explain that scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**

- *describe how an understanding of electronegativity contributes to knowledge of relative bond strength, melting points and boiling points of ionic compounds*

20–A1.3sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4, F2–4.8]**

- *explain how scientific research and technology interact in the production and distribution of beneficial materials, such as semiconductors, ceramics and composite materials.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of ionic compounds.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–A1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an investigation to determine the properties of ionic compounds (solubility, conductivity and melting point) **(IP–NS2)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–NS4)**
- *research the question, "Should all scientific research have a practical application?"* **(IP–NS1) [ICT C2–4.1]**
- *design an experiment to explore the formation of ionic compounds* **(IP–NS2)**.

Performing and Recording

Students will:

20–A1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- draw electron dot diagrams **(CT–NS2)**
- *build models of ionic solids* **(CT–NS2)**
- *perform an investigation to illustrate properties of ionic compounds* **(PR–NS3, PR–NS5)**
- *use the periodic table to make predictions about bonding and nomenclature* **(PR–NS1, AI–NS1)**
- *use model-building software to collect and integrate information on the structure of ionic crystals* **(PR–NS4) [ICT C6–4.4]**.

Analyzing and Interpreting

Students will:

20–A1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze experimental data to determine the properties of ionic compounds **(AI–NS6) [ICT C7–4.2]**
- *use data from various sources to predict the strength of bonds between ions* **(PR–NS1, AI–NS2) [ICT C6–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of ionic compounds.

Communication and Teamwork

Students will:

20–A1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate International System of Units (SI) notation, fundamental and derived units and significant digits **(CT–NS2)**★
- use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate ideas, plans and results **(CT–NS2)**★
- *analyze, critically, models of ionic compounds built by others* **(CT–NS3)**.

★ To be developed throughout the course.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of molecular substances.

Specific Outcomes for Knowledge

Students will:

20–A2.1k recall principles for assigning names to molecular substances

20–A2.2k explain why formulas for molecular substances refer to the number of atoms of each constituent element

20–A2.3k relate electron pairing to multiple and covalent bonds

20–A2.4k draw electron dot diagrams of atoms and molecules, writing structural formulas for molecular substances and using Lewis structures to predict bonding in simple molecules

20–A2.5k apply VSEPR theory to predict molecular shapes for linear, angular (V-shaped, bent), tetrahedral, trigonal pyramidal and trigonal planar molecules

20–A2.6k illustrate, by drawing or by building models, the structure of simple molecular substances

20–A2.7k explain intermolecular forces, London (dispersion) forces, dipole-dipole forces and hydrogen bonding

20–A2.8k relate properties of substances (*e.g., melting and boiling points, enthalpies of fusion and vaporization*) to the predicted intermolecular bonding in the substances

20–A2.9k determine the polarity of a molecule based on simple structural shapes and unequal charge distribution

20–A2.10k describe bonding as a continuum ranging from complete electron transfer to equal sharing of electrons.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–A2.1sts explain that the goal of science is knowledge about the natural world **(NS1)**

- *identify everyday processes and products in which molecular substances are significant, such as in the composition of household products and foods and in life processes*
- *identify examples of processes and products in which molecular substances are significant, such as in the use of adhesives and rubber by Aboriginal peoples*

20–A2.2sts explain that scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**

- *relate chemical properties to predicted intermolecular bonding by investigating melting and boiling points*

20–A2.3sts explain that scientific knowledge is subject to change as new evidence becomes apparent and as laws and theories are tested and subsequently revised, reinforced or rejected **(NS4)**

- *explain how scientific research and technology interact in the production and distribution of beneficial materials, such as polymers, household products and solvents*
- *investigate how basic knowledge about the structure of matter is advanced through nanotechnology research and development.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe the role of modelling, evidence and theory in explaining and understanding the structure, chemical bonding and properties of molecular substances.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–A2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- state a hypothesis and make a prediction about the properties of molecular substances based on attractive forces; *e.g., melting or boiling point, enthalpies of fusion and vaporization* **(IP–NS3)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–NS4)**.

Performing and Recording

Students will:

20–A2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- build models depicting the structure of simple covalent molecules, including selected organic compounds **(CT–NS2)**
- carry out an investigation to determine the melting or boiling point of a molecular substance **(PR–NS3, PR–NS5)**
- *use a thermometer and a conductivity apparatus to collect data* **(PR–NS2)**
- *carry out an investigation to compare the physical properties of molecular substances* **(PR–NS3) [ICT F1–4.2]**.

Analyzing and Interpreting

Students will:

20–A2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- graph and analyze data, for trends and patterns, on the melting and boiling points of a related series of molecular substances **(AI–NS2) [ICT C7–4.2]**.

Communication and Teamwork

Students will:

20–A2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- analyze and evaluate, objectively, models and graphs constructed by others **(CT–NS3)**
- *research the ways that scientists develop and analyze new materials* **(PR–NS1) [ICT C2–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit B: Forms of Matter: Gases

Themes: Matter, Change and Energy

Overview: Students expand their knowledge of the nature of matter through the investigation of the properties and behaviour of gases.

This unit builds on:
- Grade 9 Science, Unit B: Matter and Chemical Change
- Science 10, Unit A: Energy and Matter in Chemical Change

This unit provides a background for:
- Chemistry 30, Unit D: Chemical Equilibrium Focusing on Acid-Base Systems

Unit B will require approximately 16% of the time allotted for Chemistry 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit B but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• linear equations	Pure Mathematics 10, specific outcome 2.7; Applied Mathematics 10, specific outcomes 1.2, 1.3 and 5.1
• nonlinear equations	Pure Mathematics 10, specific outcomes 3.1 and 4.2; Pure Mathematics 20, specific outcomes 3.1 and 6.4; Applied Mathematics 10, specific outcomes 3.1, 3.2 and 3.3; Applied Mathematics 20, specific outcomes 2.1, 2.3, 2.4 and 2.5
• measurement	Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: How do familiar observations of gases relate to specific scientific models describing the behaviour of gases? What is the relationship among the pressure, temperature, volume and amount of a gas? How is the behaviour of gases used in various technologies?

General Outcomes: There is one major outcome in this unit.

Students will:

1. explain molecular behaviour, using models of the gaseous state of matter.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- Celsius and Kelvin temperature scales
- absolute zero
- real and ideal gases
- law of combining volumes
- Charles's law
- Boyle's law
- ideal gas law
- standard temperature and pressure (STP)
- standard ambient temperature and pressure (SATP)

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General Outcome 1
Students will explain molecular behaviour, using models of the gaseous state of matter.

Specific Outcomes for Knowledge

Students will:

20–B1.1k describe and compare the behaviour of real and ideal gases in terms of kinetic molecular theory

20–B1.2k convert between the Celsius and Kelvin temperature scales

20–B1.3k explain the law of combining volumes

20–B1.4k illustrate how Boyle's and Charles's laws, individually and combined, are related to the ideal gas law ($PV = nRT$)

- express pressure in a variety of ways, including units of kilopascals, atmospheres and millimetres of mercury
- perform calculations, based on the gas laws, under STP, SATP and other defined conditions.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–B1.1sts explain that science provides a conceptual and theoretical basis for predicting, interpreting and explaining natural and technological phenomena **(NS5)**

- *describe how the development of technologies capable of precise measurements of temperature and pressure (such as thermocouples, thermistors and Bourdon gauges) led to a better understanding of gases and to the formulation of the gas laws*

20–B1.2sts explain that the goal of science is knowledge about the natural world **(NS1)**

- *describe examples of natural phenomena and processes and products (such as breathing, diffusion, weather, hot air balloons, scuba diving equipment, automobile air bags, gas turbines and internal combustion engines) that illustrate the properties of gases.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain molecular behaviour, using models of the gaseous state of matter.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–B1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- state hypotheses and make predictions based on information about the pressure, temperature and volume of a gas **(IP–NS3)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–NS4)**
- *design an experiment to illustrate Boyle's and/or Charles's gas laws* **(IP–NS2)**
- *design an investigation to determine the universal gas constant (R) or absolute zero* **(IP–NS2)**
- *explore how people who are connected with the land, such as Aboriginal peoples and agricultural workers, have used plant and animal responses to changes in atmospheric pressure as indicators of changing weather* **(IP–NS1).**

Performing and Recording

Students will:

20–B1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment, in which variables are identified and controlled, to illustrate gas laws **(PR–NS3, PR–NS5) [ICT C6–4.2, F1–4.2]**
- *use thermometers, balances and other measuring devices effectively to collect data on gases* **(PR–NS3) [ICT F1–4.2]**
- *use library and electronic research tools to collect information on real and ideal gases and on applications of gases, such as hot air and weather balloons* **(PR–NS1) [ICT C1–4.1, C1–4.2]**
- *perform an investigation to determine molar mass from gaseous volume* **(PR–NS3, AI–NS6) [ICT C6–4.2].**

Analyzing and Interpreting

Students will:

20–B1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- graph and analyze experimental data that relate pressure and temperature to gas volume **(AI–NS2)**
- *identify the limitations of measurement* **(AI–NS4)**
- *identify a gas based on an analysis of experimental data* **(AI–NS2) [ICT C7–4.2].**

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain molecular behaviour, using models of the gaseous state of matter.

Communication and Teamwork

Students will:

20–B1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- communicate questions, ideas and intentions and receive, interpret, understand, support and respond to the ideas of others while collecting data on gases **(CT–NS1)**
- *prepare a group presentation, using multimedia, to illustrate how the pressure, temperature, volume and amount of a gas determines the universal gas constant (R)* **(CT–NS2) [ICT P3–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit C: Matter as Solutions, Acids and Bases

Themes: Matter, Diversity, Systems and Change

Overview: Students gain insight into the nature of matter through an investigation of change in the context of solutions, acids and bases.

This unit builds on:
- Grade 8 Science, Unit A: Mix and Flow of Matter
- Grade 9 Science, Unit B: Matter and Chemical Change and Unit C: Environmental Chemistry
- Science 10, Unit A: Energy and Matter in Chemical Change

This unit provides a background for:
- Chemistry 20, Unit D: Quantitative Relationships in Chemical Changes
- Chemistry 30, Unit B: Electrochemical Changes and Unit D: Chemical Equilibrium Focusing on Acid-Base Systems

Unit C will require approximately 32% of the time allotted for Chemistry 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit C but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• linear equations	Pure Mathematics 10, specific outcome 2.7; Applied Mathematics 10, specific outcomes 1.2, 1.3 and 5.1
• nonlinear equations	Pure Mathematics 10, specific outcomes 3.1 and 4.2; Pure Mathematics 20, specific outcomes 3.1 and 6.4; Applied Mathematics 10, specific outcomes 3.1, 3.2 and 3.3; Applied Mathematics 20, specific outcomes 2.1, 2.3, 2.4 and 2.5
• measurement	Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: How is matter as solutions, acids and bases differentiated on the basis of theories, properties and scientific evidence? Why is an understanding of acid-base and solution chemistry important in our daily lives and in the environment?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. investigate solutions, describing their physical and chemical properties
2. describe acidic and basic solutions qualitatively and quantitatively.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- homogeneous mixtures
- solubility
- electrolyte/nonelectrolyte
- concentration
- dilution
- strong acids and bases
- weak acids and bases
- monoprotic/polyprotic acid
- monoprotic/polyprotic base
- Arrhenius (modified) theory of acids and bases
- indicators
- hydronium ion/pH
- hydroxide ion/pOH
- neutralization

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General Outcome 1
Students will investigate solutions, describing their physical and chemical properties.

Specific Outcomes for Knowledge

Students will:

20–C1.1k recall the categories of pure substances and mixtures and explain the nature of homogeneous mixtures

20–C1.2k provide examples from living and nonliving systems that illustrate how dissolving substances in water is often a prerequisite for chemical change

20–C1.3k explain dissolving as an endothermic or exothermic process with respect to the breaking and forming of bonds

20–C1.4k differentiate between electrolytes and nonelectrolytes

20–C1.5k express concentration in various ways; i.e., moles per litre of solution, percent by mass and parts per million

20–C1.6k calculate, from empirical data, the concentration of solutions in moles per litre of solution and determine mass or volume from such concentrations

20–C1.7k calculate the concentrations and/or volumes of diluted solutions and the quantities of a solution and water to use when diluting

20–C1.8k use data and ionization/dissociation equations to calculate the concentration of ions in a solution

20–C1.9k define solubility and identify related factors; i.e., temperature, pressure and miscibility

20–C1.10k explain a saturated solution in terms of equilibrium; i.e., equal rates of dissolving and crystallization

20–C1.11k describe the procedures and calculations required for preparing and diluting solutions.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

20–C1.1sts explain how science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.8]**

- *provide examples of how solutions and solution concentrations are applied in products and processes, scientific studies and daily life*

20–C1.2sts explain that science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2) [ICT F2–4.8]**

- *compare the ways in which concentrations of solutions are expressed in chemistry laboratories, household products and environmental studies*

20–C1.3sts explain that scientific and technological activity may arise from, and give rise to, such personal and social values as accuracy, honesty, perseverance, tolerance, open-mindedness, critical-mindedness, creativity and curiosity **(SEC5)**

- *explain the Responsible Care program developed by the Canadian Chemical Producers' Association*

20–C1.4sts explain how science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F3–4.1]**

- *explain the significance of biomagnification in increasing the concentration of substances in an ecosystem*

20–C1.5sts explain that the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7) [ICT F2–4.2, F3–4.1]**

- *explain the role of concentration in risk-benefit analyses for determining the safe limits of particular substances, such as pesticide residues, heavy metals, chlorinated or fluorinated compounds and pharmaceuticals.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will investigate solutions, describing their physical and chemical properties.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

20–C1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design a procedure to identify the type of solution **(IP–NS2)**
- design a procedure to determine the concentration of a solution containing a solid solute **(IP–NS2)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–SEC3, PR–NS5)**.

Performing and Recording

Students will:

20–C1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- use a conductivity apparatus to differentiate solutions **(PR–NS2) [ICT C6–4.4]**
- perform an experiment to determine the concentration of a solution **(PR–NS3, PR–NS5)**
- use a balance and volumetric glassware to prepare solutions of specified concentrations **(PR–NS2, PR–NS5)**
- perform an investigation to determine the solubility of a solute in a saturated solution **(PR–ST3, PR–NS5) [ICT C6–4.2]**.

Analyzing and Interpreting

Students will:

20–C1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- use experimental data to determine the concentration of a solution **(AI–NS3) [ICT C6–4.1]**
- *evaluate the risks involved in the handling, storage and disposal of solutions commonly used in the laboratory and in the home* **(AI–SEC2, PR–NS5)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will investigate solutions, describing their physical and chemical properties.

Communication and Teamwork

Students will:

20–C1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- compare personal concentration data with the data collected by other individuals or groups **(CT–SEC4)**
- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate ideas, plans and results **(CT–NS2)**
- *use integrated software effectively and efficiently to incorporate data, graphics and text* **(CT–ST2) [ICT P4–4.3]**
- *conduct, collectively, a risk-benefit analysis of the pollution of waterways by the release of effluents and propose a plan for reducing the impact on the ecosystem* **(IP–SEC3, AI–SEC3, CT–SEC1) [ICT F3–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe acidic and basic solutions qualitatively and quantitatively.

Specific Outcomes for Knowledge

Students will:

20–C2.1k recall International Union of Pure and Applied Chemistry (IUPAC) nomenclature of acids and bases

20–C2.2k recall the empirical definitions of acidic, basic and neutral solutions determined by using indicators, pH and electrical conductivity

20–C2.3k calculate $H_3O^+(aq)$ and $OH^-(aq)$ concentrations and the pH and pOH of acidic and basic solutions based on logarithmic expressions; i.e., $pH = -\log[H_3O^+]$ and $pOH = -\log[OH^-]$

20–C2.4k use appropriate SI units to communicate the concentration of solutions and express pH and concentration answers to the correct number of significant digits; i.e., use the number of decimal places in the pH to determine the number of significant digits of the concentration

20–C2.5k compare magnitude changes in pH and pOH with changes in concentration for acids and bases

20–C2.6k explain how the use of indicators, pH paper or pH meters can be used to measure $H_3O^+(aq)$

20–C2.7k define Arrhenius (modified) acids as substances that produce $H_3O^+(aq)$ in aqueous solutions and recognize that the definition is limited

20–C2.8k define Arrhenius (modified) bases as substances that produce $OH^-(aq)$ in aqueous solutions and recognize that the definition is limited

20–C2.9k define neutralization as a reaction between hydronium and hydroxide ions

20–C2.10k differentiate, qualitatively, between strong and weak acids and between strong and weak bases on the basis of ionization and dissociation; i.e., pH, reaction rate and electrical conductivity

20–C2.11k identify monoprotic and polyprotic acids and bases and compare their ionization/dissociation.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

20–C2.1sts explain that the goal of technology is to provide solutions to practical problems **(ST1) [ICT F2–4.4]**

- *relate the concept of pH to solutions encountered in everyday life, such as pharmaceuticals, shampoo and other cleaning products, aquatic and terrestrial environments, and blood/blood products*

20–C2.2sts explain that technological problems often require multiple solutions that involve different designs, materials and processes and that have both intended and unintended consequences **(ST3) [ICT F3–4.1]**

- *provide examples of processes and products that use knowledge of acid and base chemistry (the pulp and paper industry, the petrochemical industry, food preparation and preservation, cleaning aids, sulfuric acid in car batteries, treating accidental acid or base spills using neutralization and dilution)*
- *explain the significance of the strength and concentration of solutions in everyday life (pharmaceuticals, chemical spills, transportation of dangerous goods, toxicity)*
- *identify examples in Alberta in which holistic practices used by some Aboriginal communities can be used to moderate the impact of development in industries such as the petrochemical industry.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe acidic and basic solutions qualitatively and quantitatively.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

20–C2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment to differentiate among acidic, basic and neutral solutions **(IP–NS2)**
- design an experiment to differentiate between weak and strong acids and between weak and strong bases **(IP–NS2)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–ST3)**.

Performing and Recording

Students will:

20–C2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- construct a table or graph to compare pH and hydronium ion concentration, illustrating that as the hydronium ion concentration increases, the pH decreases **(PR–NS4)**
- *use a pH meter to determine the acidity and/or alkalinity of a solution* **(PR–NS2) [ICT C6–4.4]**.

Analyzing and Interpreting

Students will:

20–C2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- use indicators to determine the pH for a variety of solutions **(PR–NS2, AI–NS6)**
- *assess, qualitatively, the risks and benefits of producing, using and transporting acidic and basic substances, based on WHMIS and transportation of dangerous goods guidelines* **(AI–ST2)**.

Communication and Teamwork

Students will:

20–C2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *research, collectively, the relationship between sulfuric acid and industrialization* **(CT–SEC1) [ICT C1–4.1, C2–4.1]**
- *evaluate technologies used to reduce emissions that lead to acid deposition* **(CT–SEC1) [ICT C6–4.5]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit D: Quantitative Relationships in Chemical Changes

Themes: Matter and Change

Overview: Students focus on chemical change and the quantitative relationships contained in balanced chemical equations. They are required to use stoichiometric principles and mathematical manipulation to predict quantities of substances consumed or produced in chemical reaction systems.

This unit builds on:

- Science 10, Unit A: Energy and Matter in Chemical Change

This unit provides a background for:

- Chemistry 30, Unit A: Thermochemical Changes, Unit B: Electrochemical Changes and Unit D: Chemical Equilibrium Focusing on Acid-Base Systems

Unit D will require approximately 32% of the time allotted for Chemistry 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit D but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• linear equations	Pure Mathematics 10, specific outcome 2.7; Applied Mathematics 10, specific outcomes 1.2, 1.3 and 5.1
• measurement	Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: How do scientists, engineers and technologists use mathematics to analyze chemical change? How are balanced chemical equations used to predict yields in chemical reactions?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explain how balanced chemical equations indicate the quantitative relationships between reactants and products involved in chemical changes
2. use stoichiometry in quantitative analysis.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- chemical reaction equations
- net ionic equations
- spectator ions
- reaction stoichiometry
- precipitation
- limiting and excess reagents
- actual, theoretical and percent yield
- titration
- end point
- equivalence point
- titration curves for strong acids and bases

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General Outcome 1
Students will explain how balanced chemical equations indicate the quantitative relationships between reactants and products involved in chemical changes.

Specific Outcomes for Knowledge

Students will:

20–D1.1k predict the product(s) of a chemical reaction based upon the reaction type

20–D1.2k recall the balancing of chemical equations in terms of atoms, molecules and moles

20–D1.3k contrast quantitative and qualitative analysis

20–D1.4k write balanced ionic and net ionic equations, including identification of spectator ions, for reactions taking place in aqueous solutions

20–D1.5k calculate the quantities of reactants and/or products involved in chemical reactions, using gravimetric, solution or gas stoichiometry.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

20–D1.1sts explain that the products of technology are devices, systems and processes that meet given needs; however, these products cannot solve all problems **(ST6) [ICT F2–4.4]**

- *analyze the chemical reactions involved in various industrial and commercial processes and products that use stoichiometric and chemical principles:*
  - *production of urea*
  - *fertilizers*
  - *fuel combustion*
  - *water treatment*
  - *air bag deployment*
  - *neutralization of excess stomach acid.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain how balanced chemical equations indicate the quantitative relationships between reactants and products involved in chemical changes.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

20–D1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- plan and predict states, products and theoretical yields for chemical reactions **(IP–NS3) [ICT C6–4.1]**
- design an experiment to identify an ion; *e.g., precipitation, flame test* **(IP–NS2)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–ST3)**.

Performing and Recording

Students will:

20–D1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- translate word equations for chemical reactions into chemical equations, including states of matter for the products and reactants **(CT–ST2)**
- balance chemical equations for chemical reactions, using lowest whole-number coefficients **(AI–ST3)**.

Analyzing and Interpreting

Students will:

20–D1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- interpret stoichiometric ratios from chemical reaction equations **(AI–ST3)**
- perform calculations to determine theoretical yields **(AI–NS3) [ICT C6–4.1]**
- use appropriate SI notation, fundamental and derived units and significant digits when performing stoichiometric calculations **(AI–NS3, CT–ST2)**.

Communication and Teamwork

Students will:

20–D1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *use integrated software effectively and efficiently to incorporate data and text* **(AI–NS3, CT–ST2) [ICT P4–4.3]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will use stoichiometry in quantitative analysis.

Specific Outcomes for Knowledge

Students will:

20–D2.1k explain chemical principles (i.e., conservation of mass in a chemical change), using quantitative analysis

20–D2.2k identify limiting and excess reagents in chemical reactions

20–D2.3k define theoretical yields and actual yields

20–D2.4k explain the discrepancy between theoretical and actual yields

20–D2.5k draw and interpret titration curves, using data from titration experiments involving strong monoprotic acids and strong monoprotic bases

20–D2.6k describe the function and choice of indicators in titrations

20–D2.7k identify equivalence points on strong monoprotic acid–strong monoprotic base titration curves and differentiate between the indicator end point and the equivalence point.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

20–D2.1sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4]**

- *describe how industries apply principles of stoichiometry to minimize waste and maximize yield*

20–D2.2sts explain how the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7) [ICT F3–4.1]**

- *assess the significance of specific by-products from industrial, commercial and household chemical reactions*
- *analyze the use of technologies, such as smokestacks and catalytic converters, to reduce emissions that are harmful to the environment, such as $SO_2(g)$ and greenhouse gases.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will use stoichiometry in quantitative analysis.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

20–D2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design a procedure, using crystallization, filtration or titration, to determine the concentration of a solution **(IP–ST2)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–ST3)**
- predict the approximate equivalence point for a strong monoprotic acid–strong monoprotic base titration and select an appropriate indicator **(IP–NS3, IP–NS4)**.

Performing and Recording

Students will:

20–D2.2s conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform a titration to determine the concentration of an acid or a base restricted to strong monoprotic acid–strong monoprotic base combinations **(PR–NS3)**
- *use probes and software to collect titration data* **(PR–NS2) [ICT C6–4.4]**
- *research methods used by industry to reduce emissions* **(PR–ST1) [ICT F2–4.4]**
- *design a prototype of a chemical industrial plant* **(PR–ST2)**.

Analyzing and Interpreting

Students will:

20–D2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- calculate theoretical and actual yield and percent yield and error, and account for discrepancies between the theoretical and actual yields **(AI–NS3, AI–NS4) [ICT C6–4.1]**
- analyze and evaluate experimental data of a precipitation reaction to determine the concentration of a solution **(AI–NS3, AI–NS4, AI–NS6) [ICT C7–4.2]**
- graph and analyze titration curves for acid-base experiments restricted to strong monoprotic acid–strong monoprotic base combinations **(PR–NS4)**
- use appropriate SI notation, fundamental and derived units and significant digits when performing stoichiometric calculations **(CT–ST2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will use stoichiometry in quantitative analysis.

Communication and Teamwork

Students will:

20–D2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- standardize an acidic or a basic solution and compare group results **(PR–NS2)**
- *draw a flowchart for an industrial chemical process* **(CT–ST2)**
- *use integrated software effectively and efficiently to produce work that incorporates data, graphics and text* **(CT–ST2) [ICT P4–4.3]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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CHEMISTRY 30

Provincial implementation of Chemistry 30 is September 2008.
Implementation prior to this date is **not** approved.

Chemistry 30 consists of four units of study:

A. Thermochemical Changes
B. Electrochemical Changes
C. Chemical Changes of Organic Compounds
D. Chemical Equilibrium Focusing on Acid-Base Systems

Attitude Outcomes

Students will be encouraged to develop positive attitudes that support the responsible acquisition and application of knowledge related to science and technology. The following attitude outcomes are to be developed throughout Chemistry 30, in conjunction with the specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills in each unit.

Interest in Science

Students will be encouraged to:
show interest in science-related questions and issues and confidently pursue personal interests and career possibilities within science-related fields; *e.g.,*

- *appreciate how scientific problem solving and the development of new technologies are related*
- *recognize the contributions of science and technology to the progress of civilizations*
- *demonstrate interest in science and technology topics related to everyday life*
- *recognize the usefulness of being skilled at mathematics and problem solving*
- *explore where further science- and technology-related studies and careers can be pursued*
- *investigate careers in the fields of research and industry.*

Mutual Respect

Students will be encouraged to:
appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds; *e.g.,*

- *use a multiperspective approach, considering scientific, technological, economic, cultural, political and environmental factors when formulating conclusions, solving problems or making decisions on an STS issue*
- *recognize the contributions of various peoples and cultures in advancing understanding and applications of chemistry*
- *recognize that the scientific approach is one of many ways of viewing the universe*
- *recognize the research contributions of both men and women*
- *develop an interest in global energy issues and the effectiveness of local activities in contributing to the solution of problems related to energy.*

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Scientific Inquiry

Students will be encouraged to:
seek and apply evidence when evaluating alternative approaches to investigations, problems and issues; *e.g.,*

- *value the need for accuracy and precision in data collection*
- *appreciate the creativity and perseverance required to develop workable solutions to problems*
- *tolerate the uncertainty involved in experimentation*
- *appreciate that knowledge of chemistry has been enhanced by evidence obtained from the application of technology, particularly instruments for making measurements and managing data*
- *research alternative models, explanations and theories when confronted with discrepant events*
- *evaluate, critically, inferences and conclusions and recognize bias, being aware of the many variables involved in experimentation*
- *appreciate the importance of careful laboratory techniques and precise calculations in obtaining accurate results.*

Collaboration

Students will be encouraged to:
work collaboratively in planning and carrying out investigations and in generating and evaluating ideas; *e.g.,*

- *assume a variety of roles within a group, as required*
- *accept responsibility for any task that helps the group complete an activity*
- *evaluate the ideas of others objectively*
- *seek the points of view of others and consider a multitude of perspectives.*

Stewardship

Students will be encouraged to:
demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment; *e.g.,*

- *consider a variety of perspectives when addressing issues related to energy use, weighing scientific, technological and ecological factors*
- *develop a sense of responsibility toward the use of energy*
- *develop a sense of responsibility regarding the use and disposal of chemicals and materials*
- *identify and evaluate ways of using chemical potential energy sources efficiently*
- *develop an awareness that the application of technology has risks and benefits*
- *evaluate the contributions of technological innovations to quality of life and care of the environment*
- *evaluate the choices that scientists and technologists make when carrying out controversial research.*

Safety

Students will be encouraged to:
show concern for safety in planning, carrying out and reviewing activities, referring to the Workplace Hazardous Materials Information System (WHMIS) and consumer product labelling information; *e.g.,*

- *include safety as a requirement in scientific and technological endeavours*
- *use equipment and materials appropriately*
- *assume responsibility for the safety of all those who share a common working environment*
- *use minimal quantities of chemicals when performing experiments*
- *keep the workstation uncluttered, ensuring that only appropriate laboratory materials are present*
- *clean up after an activity and dispose of materials in a safe place, according to safety guidelines.*

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Unit A: Thermochemical Changes

Themes: Energy, Change and Systems

Overview: In this unit, students study energy as it relates to chemical changes and quantify the energy involved in thermochemical systems, and consider the various aspects of energy use on society.

This unit builds on:

- Grade 7 Science, Unit C: Heat and Temperature
- Science 10, Unit A: Energy and Matter in Chemical Change and Unit D: Energy Flow in Global Systems

Unit A will require approximately 20% of the time allotted for Chemistry 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit A but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• linear equations	Pure Mathematics 10, specific outcome 2.7; Applied Mathematics 10, specific outcome 5.1
• measurement	Applied Mathematics 10, specific outcomes 1.2 and 1.3; Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: How does our society use the energy of chemical changes? What are the impacts of energy use on society and the environment? How do chemists determine how much energy will be produced or absorbed for a given chemical reaction?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. determine and interpret energy changes in chemical reactions
2. explain and communicate energy changes in chemical reactions.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- enthalpy of formation
- enthalpy of reaction
- ΔH notation
- Hess' law
- molar enthalpy
- energy diagrams
- activation energy
- catalysts
- calorimetry
- fuels and energy efficiency

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General Outcome 1
Students will determine and interpret energy changes in chemical reactions.

Specific Outcomes for Knowledge

Students will:

30–A1.1k recall the application of $Q = mc\Delta t$ to the analysis of heat transfer

30–A1.2k explain, in a general way, how stored energy in the chemical bonds of hydrocarbons originated from the sun

30–A1.3k define enthalpy and molar enthalpy for chemical reactions

30–A1.4k write balanced equations for chemical reactions that include energy changes

30–A1.5k use and interpret ΔH notation to communicate and calculate energy changes in chemical reactions

30–A1.6k predict the enthalpy change for chemical equations using standard enthalpies of formation

30–A1.7k explain and use Hess' law to calculate energy changes for a net reaction from a series of reactions

30–A1.8k use calorimetry data to determine the enthalpy changes in chemical reactions

30–A1.9k identify that liquid water and carbon dioxide gas are reactants in photosynthesis and products of cellular respiration and that gaseous water and carbon dioxide gas are the products of hydrocarbon combustion in an open system

30–A1.10k classify chemical reactions as endothermic or exothermic, including those for the processes of photosynthesis, cellular respiration and hydrocarbon combustion.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

30–A1.1sts explain that the goal of technology is to provide solutions to practical problems **(ST1) [ICT F2–4.4]**

- *provide examples of personal reliance on the chemical potential energy of matter, such as the use of fossil fuels*
- *identify ways to use energy more efficiently*
- *identify and explain the selection of different fuels used by communities in urban, rural and remote areas, and compare that selection to the fuels used by the early inhabitants of a particular area of Alberta*

30–A1.2sts explain that technological problems often require multiple solutions that involve different designs, materials and processes and that have both intended and unintended consequences **(ST3) [ICT F3–4.1]**

- *explain the applications of fossil fuels, with examples from industries in Alberta*
- *evaluate the impact of the combustion of various energy sources, including fossil fuels and biomass, on personal health and the environment and describe the technologies used by early peoples to mitigate the harmful effects of combustion.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will determine and interpret energy changes in chemical reactions.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

30–A1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design a method to compare the molar enthalpy change when burning two or more fuels *(e.g., octane, propane, ethanol and historic fuels such as seal or whale oil)*, identifying and controlling major variables **(IP–ST1, IP–ST2)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–ST3)**.

Performing and Recording

Students will:

30–A1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform calorimetry experiments to determine the molar enthalpy change of chemical reactions **(PR–NS3) [ICT C6–4.1]**
- use thermometers or temperature probes appropriately when measuring temperature changes **(PR–NS3, PR–ST3) [ICT C6–4.4]**
- *use a computer-based laboratory to compile and organize data from an experiment to demonstrate molar enthalpy change* **(PR–NS4) [ICT C6–4.2]**
- *select and integrate information from various print and electronic sources to create multiple-linked documents about the use of alternative fuels* **(PR–ST1) [ICT C1–4.1, P5–4.1]**.

Analyzing and Interpreting

Students will:

30–A1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- compare energy changes associated with a variety of chemical reactions through the analysis of data and energy diagrams **(AI–NS3) [ICT C7–4.2]**
- *manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases or spreadsheets* **(AI–ST3) [ICT P2–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will determine and interpret energy changes in chemical reactions.

Communication and Teamwork

Students will:

30–A1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate International System of Units (SI) notation, fundamental and derived units and significant digits **(CT–ST2)★**
- use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate ideas, plans and results **(CT–ST2)★**
- *use advanced menu features within word processing software to accomplish a task and to insert tables, graphs, text and graphics* **(CT–ST2) [ICT P4–4.3]**.

★ To be developed throughout the course.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain and communicate energy changes in chemical reactions.

Specific Outcomes for Knowledge

Students will:

30–A2.1k define activation energy as the energy barrier that must be overcome for a chemical reaction to occur

30–A2.2k explain the energy changes that occur during chemical reactions, referring to bonds breaking and forming and changes in potential and kinetic energy

30–A2.3k analyze and label energy diagrams of a chemical reaction, including reactants, products, enthalpy change and activation energy

30–A2.4k explain that catalysts increase reaction rates by providing alternate pathways for changes, without affecting the net amount of energy involved; *e.g., enzymes in living systems.*

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

30–A2.1sts explain that the goal of technology is to provide solutions to practical problems **(ST1)** **[ICT F2–4.4]**

- *explain how catalysts, such as catalytic converters on automobiles, reduce air pollution resulting from the burning of fuels*

30–A2.2sts explain that the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7)** **[ICT F2–4.2, F3–4.1]**

- *assess, qualitatively, the risks and benefits of relying on fossil fuels as energy sources*

30–A2.3sts explain that the products of technology are devices, systems and processes that meet given needs; however, these products cannot solve all problems **(ST6)** **[ICT F3–4.1]**

- *evaluate the economic and environmental impacts of different fuels by relating carbon dioxide emissions and the heat content of a fuel.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain and communicate energy changes in chemical reactions.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

30–A2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–ST3)**
- *design an experimental procedure to illustrate the effect of a catalyst on a chemical reaction* **(IP–ST2)**.

Performing and Recording

Students will:

30–A2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- draw enthalpy diagrams, indicating changes in energy for chemical reactions **(PR–NS4)**
- *use library and electronic research tools to compile information on the energy content of fuels used in Alberta power plants* **(PR–ST1) [ICT C1–4.1]**
- *design and build a heating device* **(PR–ST2)**.

Analyzing and Interpreting

Students will:

30–A2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- draw and interpret enthalpy diagrams for chemical reactions **(AI–NS2) [ICT C7–4.2]**
- explain the discrepancy between the theoretical and actual efficiency of a thermal energy conversion system **(AI–NS3)**
- *determine the efficiency of thermal energy conversion systems* **(AI–NS3)**
- *assess whether coal or natural gas should be used to fuel thermal power plants in Alberta* **(AI–ST2)**
- *evaluate a personally designed and constructed heating device, including a calculation of its efficiency* **(AI–ST2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain and communicate energy changes in chemical reactions.

Communication and Teamwork

Students will:

30–A2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate SI notation, fundamental and derived units and significant digits to calculate and communicate enthalpy changes **(CT–ST2)**
- *work cooperatively with others to develop a plan to build an energy conversion device and seek feedback, test and review the plan, make revisions and implement the plan* **(CT–ST1)**
- *use advanced menu features within word processing software to accomplish a task and to insert tables, graphs, text and graphics* **(CT–SEC2) [ICT P4–4.3]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit B: Electrochemical Changes

Themes: Change and Energy

Overview: In this unit, students study electrochemical change and analyze the matter and energy changes within a system.

This unit builds on:

- Science 9, Unit D: Electrical Principles and Technologies
- Science 10, Unit A: Energy and Matter in Chemical Change
- Chemistry 20, Unit A: The Diversity of Matter and Chemical Bonding and Unit D: Quantitative Relationships in Chemical Changes

Unit B will require approximately 30% of the time allotted for Chemistry 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit B but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• linear equations	Pure Mathematics 10, specific outcome 2.7; Applied Mathematics 10, specific outcome 5.1
• measurement	Applied Mathematics 10, specific outcomes 1.2 and 1.3; Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: What is an electrochemical change? How have scientific knowledge and technological innovation been integrated into the field of electrochemistry?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explain the nature of oxidation-reduction reactions
2. apply the principles of oxidation-reduction to electrochemical cells.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in the courses. The intended level and scope of treatment is defined by the outcomes.

- oxidation
- reduction
- oxidizing agent
- reducing agent
- oxidation-reduction (redox) reaction
- oxidation number
- half-reaction
- disproportionation
- spontaneity
- standard reduction potential
- voltaic cell
- electrolytic cell
- electrolysis
- standard cell potential
- Faraday's law
- corrosion

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General Outcome 1
Students will explain the nature of oxidation-reduction reactions.

Specific Outcomes for Knowledge

Students will:

30–B1.1k define oxidation and reduction operationally and theoretically

30–B1.2k define oxidizing agent, reducing agent, oxidation number, half-reaction, disproportionation

30–B1.3k differentiate between redox reactions and other reactions, using half-reactions and/or oxidation numbers

30–B1.4k identify electron transfer, oxidizing agents and reducing agents in redox reactions that occur in everyday life, in both living systems (*e.g., cellular respiration, photosynthesis*) and nonliving systems; i.e., corrosion

30–B1.5k compare the relative strengths of oxidizing and reducing agents, using empirical data

30–B1.6k predict the spontaneity of a redox reaction, based on standard reduction potentials, and compare their predictions to experimental results

30–B1.7k write and balance equations for redox reactions in acidic and neutral solutions by

- using half-reaction equations obtained from a standard reduction potential table
- developing simple half-reaction equations from information provided about redox changes
- assigning oxidation numbers, where appropriate, to the species undergoing chemical change

30–B1.8k perform calculations to determine quantities of substances involved in redox titrations.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

30–B1.1sts explain how the goal of technology is to provide solutions to practical problems **(ST1) [ICT F2–4.4]**

- describe the methods and devices used to prevent corrosion; i.e., physical coatings and cathodic protection
- *describe how the process of trial and error was used by early peoples to extract metals from ore*

30–B1.2sts explain that technological problems often require multiple solutions that involve different designs, materials and processes and that have both intended and unintended consequences **(ST3) [ICT F3–4.1]**

- *analyze redox reactions used in industry and commerce, such as pulp and paper, textiles, water treatment and food processing.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain the nature of oxidation-reduction reactions.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

30–B1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment to determine the reactivity of various metals **(IP–NS1, IP–NS2, IP–NS3) [ICT C6–4.5]**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–ST3)**.

Performing and Recording

Students will:

30–B1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- select and correctly use the appropriate equipment to perform a redox titration experiment **(PR–NS2, PR–NS3) [ICT C6–4.5, F1–4.2]**
- use a standard reduction potential table as a tool when considering the spontaneity of redox reactions and their products **(PR–ST3)**
- *create charts, tables or spreadsheets that present the results of redox experiments* **(PR–NS4) [ICT P2–4.1]**.

Analyzing and Interpreting

Students will:

30–B1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- evaluate data from an experiment to derive a simple reduction table **(AI–ST3, AI–NS4)**
- *interpret patterns and trends in data derived from redox reactions* **(A1–NS2) [ICT C7–4.2]**
- *identify the limitations of data collected from redox experiments* **(A1–NS4)**.

Communication and Teamwork

Students will:

30–B1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate equations for redox reactions and answers to problems related to redox titrations **(CT–ST2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will apply the principles of oxidation-reduction to electrochemical cells.

Specific Outcomes for Knowledge

Students will:

30–B2.1k define anode, cathode, anion, cation, salt bridge/porous cup, electrolyte, external circuit, power supply, voltaic cell and electrolytic cell

30–B2.2k identify the similarities and differences between the operation of a voltaic cell and that of an electrolytic cell

30–B2.3k predict and write the half-reaction equation that occurs at each electrode in an electrochemical cell

30–B2.4k recognize that predicted reactions do not always occur; *e.g., the production of chlorine gas from the electrolysis of brine*

30–B2.5k explain that the values of standard reduction potential are all relative to 0 volts, as set for the hydrogen electrode at standard conditions

30–B2.6k calculate the standard cell potential for electrochemical cells

30–B2.7k predict the spontaneity or nonspontaneity of redox reactions, based on standard cell potential, and the relative positions of half-reaction equations on a standard reduction potential table

30–B2.8k calculate mass, amounts, current and time in single voltaic and electrolytic cells by applying Faraday's law and stoichiometry.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

30–B2.1sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4, F2–4.8]**

- *analyze the relationship of scientific knowledge and technological development in the applications of voltaic and electrolytic cells in such applications as batteries, electroplating, refining metals from ores, electrowinning and sanitizing swimming pools with chlorine compounds*

30–B2.2sts describe science and technology applications that have developed in response to human and environmental needs **(ST6) [ICT F3–4.1]**

- *investigate the use of technology, such as galvanism, metallurgy, magnesium coupling, painting, cathodic protection, to solve practical problems related to corrosion*

30–B2.3sts explain that science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2) [ICT F2–4.4, F2–4.8]**

- *evaluate the economic importance to modern society of electrochemical cells, particularly fuel cells, and predict their future importance in transportation, the recycling of metals and the reduction of emissions from smokestacks.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will apply the principles of oxidation-reduction to electrochemical cells.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

30–B2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment, including a labelled diagram, to test predictions regarding spontaneity, products and the standard cell potential for reactions occurring in electrochemical cells **(IP–NS1, IP–NS2, IP–NS3)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–ST3)**
- *develop a plan to build a battery and seek feedback, test and review the plan and make revisions to the plan* **(IP–ST2)**.

Performing and Recording

Students will:

30–B2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- construct and observe electrochemical cells **(PR–ST2, PR–ST3, PR–NS5)**
- *investigate the issue of the disposal of used batteries and propose alternative solutions to this problem* **(PR–ST1, AI–ST2) [ICT C2–4.1]**
- *compile and display evidence and information about voltaic and electrolytic cells in a variety of formats, including diagrams, flowcharts, tables, graphs and scatterplots* **(PR–NS4) [ICT P2–4.1]**.

Analyzing and Interpreting

Students will:

30–B2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- identify the products of electrochemical cells **(AI–ST3)**
- compare predictions with observations of electrochemical cells **(AI–ST3)**
- identify the limitations of data collected on an electrochemical cell **(AI–NS4)**
- explain the discrepancies between the theoretical and actual cell potential **(AI–NS4)**
- *evaluate the efficiencies and practicalities of various electrochemical cells for use as batteries* **(AI–ST1)**
- *evaluate experimental designs for voltaic and electrolytic cells and suggest improvements and alternatives* **(AI–ST1)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will apply the principles of oxidation-reduction to electrochemical cells.

Communication and Teamwork

Students will:

30–B2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate SI notation, fundamental and derived units and significant digits to communicate answers to problems related to functioning electrochemical cells **(CT–ST2)**
- *create multiple-linked documents, selecting and integrating information from various print and electronic sources or from several parts of the same source, to prepare a presentation on the use of hydrogen fuel cells for transportation and heating* **(CT–SEC2) [ICT C1–4.1, C1–4.4, PS–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit C: Chemical Changes of Organic Compounds

Themes: Change, Diversity and Energy

Overview: In this introduction to organic chemistry, students learn about common organic compounds and describe their properties and reactions. The significance of organic chemistry, in the context of technological applications and quality of life, is explored.

This unit builds on:
- Chemistry 20, Unit A: The Diversity of Matter and Chemical Bonding

Unit C will require approximately 20% of the time allotted for Chemistry 30.

Links to Mathematics: None.

Focusing Questions: What are the common organic compounds and what is the system for naming them? How does society rely on organic compounds? How can society ensure that the technical applications of organic chemistry are assessed to ensure future quality of life and a sustainable environment?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explore organic compounds as a common form of matter
2. describe chemical reactions of organic compounds.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the learning outcomes.

- organic compounds
- naming organic compounds
- structural formulas
- structural isomers
- monomers
- polymers
- aliphatic and aromatic compounds
- saturated/unsaturated hydrocarbons
- functional groups identifying alcohols, carboxylic acids, esters and halogenated hydrocarbons
- esterification
- combustion reactions
- polymerization
- addition, substitution
- elimination

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General Outcome 1
Students will explore organic compounds as a common form of matter.

Specific Outcomes for Knowledge

Students will:

30–C1.1k define organic compounds as compounds containing carbon, recognizing inorganic exceptions such as carbonates, cyanides, carbides and oxides of carbon

30–C1.2k identify and describe significant organic compounds in daily life, demonstrating generalized knowledge of their origins and applications; *e.g., methane, methanol, ethane, ethanol, ethanoic acid, propane, benzene, octane, glucose, polyethylene*

30–C1.3k name and draw structural, condensed structural and line diagrams and formulas, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature guidelines, for saturated and unsaturated aliphatic (including cyclic) and aromatic carbon compounds

- containing up to 10 carbon atoms in the parent chain (*e.g., pentane; 3-ethyl-2,4-dimethylpentane*) or cyclic structure (*e.g., cyclopentane*)
- containing only one type of a functional group (with multiple bonds categorized as a functional group; *e.g., pent-2-ene*), including simple halogenated hydrocarbons (*e.g., 2-chloropentane*), alcohols (*e.g., pentan-2-ol*), carboxylic acids (*e.g., pentanoic acid*) and esters (*e.g., methyl pentanoate*), and with multiple occurrences of the functional group limited to halogens (*e.g., 2-bromo-1-chloropentane*) and alcohols (*e.g., pentane-2,3-diol*)

30–C1.4k identify types of compounds from the hydroxyl, carboxyl, ester linkage and halogen functional groups, given the structural formula

30–C1.5k define structural isomerism as compounds having the same empirical formulas, but with different structural formulas, and relate the structures to variations in the properties of the isomers

30–C1.6k compare, both within a homologous series and among compounds with different functional groups, the boiling points and solubility of examples of aliphatics, aromatics, alcohols and carboxylic acids

30–C1.7k describe, in general terms, the physical, chemical and technological processes (fractional distillation and solvent extraction) used to separate organic compounds from natural mixtures or solutions; *e.g., petroleum refining, bitumen recovery.*

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–C1.1sts explain how science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.4, F2–4.8]**

- *describe where organic compounds are used in processes and common products, such as in hydrogenation to produce margarine and esters used as flavouring agents*
- *describe Aboriginal use of organic substances for waterproofing, tanning, dyeing, medicines, salves and insect repellents*

30–C1.2sts explain that science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2) [ICT F2–4.8]**

- *explain how, as a result of chemistry and chemical technology, synthetic compounds of great benefit to society, such as plastics, medicines, hydrocarbon fuels and pesticides, have been produced.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explore organic compounds as a common form of matter.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

30–C1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design a procedure to identify types of organic compounds **(IP–NS1, IP–NS2, IP–NS3)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–SEC3)**
- design a procedure to separate a mixture of organic compounds, based on boiling point differences **(IP–ST2, IP–ST3)**.

Performing and Recording

Students will:

30–C1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- build molecular models depicting the structures of selected organic and inorganic compounds **(PR–NS4) [ICT C6–4.4]**
- perform an experiment to compare the properties of organic compounds with inorganic compounds, considering properties such as solubility, viscosity, density, conductivity, reactivity **(PR–NS2, PR–NS3, PR–NS5)**.

Analyzing and Interpreting

Students will:

30–C1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- follow appropriate IUPAC guidelines when writing the names and formulas of organic compounds **(AI–NS1)**
- compile and organize data to compare the properties of structural isomers; *e.g., pairs of hydrocarbon isomers and primary, secondary and tertiary alcohols* **(AI–NS1) [ICT C6–4.2]**
- interpret the results of a test to distinguish between a saturated and an unsaturated aliphatic, using aqueous bromine or potassium permanganate solutions **(AI–NS2)**
- *analyze the contributions and limitations of scientific and technological knowledge in societal decision making, in relation to the costs and benefits of societal use of petrochemicals, pharmaceuticals and pesticides* **(AI–SEC2) [ICT F3–4.1]**
- *explore aspects of present-day reliance on extracted or synthesized nutrients, with consideration of the synergy of compounds (reliance on vitamin supplements, meal replacements and nutraceuticals versus traditional methods of consuming natural foods)* **(AI–SEC2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explore organic compounds as a common form of matter.

Communication and Teamwork

Students will:

30–C1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *use advanced menu features within word processing software to accomplish a task and to insert tables, graphs, text and graphics* **(CT–SEC2) [ICT P4–4.3]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe chemical reactions of organic compounds.

Specific Outcomes for Knowledge

Students will:

30–C2.1k define, illustrate and provide examples of simple addition, substitution, elimination, esterification and combustion reactions

30–C2.2k predict products and write and interpret balanced equations for the above reactions

30–C2.3k define, illustrate and provide examples of monomers *(e.g., ethylene)*, polymers *(e.g., polyethylene)* and polymerization in living systems *(e.g., carbohydrates, proteins)* and nonliving systems *(e.g., nylon, polyester, plastics)*

30–C2.4k relate the reactions described above to major reactions that produce thermal energy and economically important compounds from fossil fuels.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–C2.1sts explain how science and technology are developed to meet societal needs and expand human capability **(SEC1)**

- *describe processes for obtaining economically important compounds from fossil fuels; e.g.,*
  - *compare hydrocracking and catalytic reforming*
  - *describe bitumen upgrading*
- *describe major reactions used in the petrochemical industry in Alberta, such as in the production of methanol, ethylene glycol, polyethylene, polyvinyl chloride (PVC) and urea formaldehyde*
- *investigate the application of nanoscience and nanotechnology in the petrochemical industry and the medical sciences*

30–C2.2sts explain that science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2) [ICT F2–4.8]**

- *describe processes involved in producing fuels; e.g.,*
  - *adjusting octane/cetane rating*
  - *reducing sulfur content*
  - *adding compounds such as oxygenated additives (blending with ethanol)*

30–C2.3sts explain how science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F3–4.1]**

- *assess the positive and negative effects of various reactions involving organic compounds, relating these processes to quality of life and potential health and environmental issues; e.g.,*
  - *burning fossil fuels and climate change*
  - *production of pharmaceuticals and foods*
  - *by-products (CO_2, dioxins) of common reactions*
  - *recycling of plastics*
  - *impact of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons(HCFCs) on the ozone layer*
  - *transfats in the diet*
- *evaluate the implications of the development of nanoscience and nanotechnology, for application in the petrochemical industry and the medical sciences, on society and the environment.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe chemical reactions of organic compounds.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

30–C2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- predict the ester formed from an alcohol and an organic acid **(IP–NS3)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–SEC3)**
- *design a procedure to prepare a polymer* **(IP–NS1).**

Performing and Recording

Students will:

30–C2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment to investigate the reactions of organic compounds;
  e.g.,
  - *synthesize a polymer, such as nylon or "slime"*
  - *produce an ester*
  - *investigate methods of making soap*

  (IP–NS1, IP–NS2, IP–NS3, IP–NS4)
- use library and electronic research tools to collect information on:
  - *bitumen upgrading*
  - *the octane/cetane ratings of fuels and how they are determined*
  - *the costs and benefits of supporting the petrochemical industry*

  (PR–SEC1, PR–SEC2) [ICT C1–4.1].

Analyzing and Interpreting

Students will:

30–C2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- use IUPAC conventions when writing organic chemical reactions **(AI–NS1)**
- investigate the issue of greenhouse gases; identify some greenhouse gases, including methane, carbon dioxide, water and dinitrogen oxide (nitrous oxide); and analyze their contribution to climate change **(AI–SEC1, AI–SEC2) [ICT F3–4.1]**
- draw or use models to illustrate polymers **(CT–ST2)**
- *analyze a process for producing polymers* **(AI–ST1)**
- *analyze efficiencies and negative by-products related to chemical processes in organic chemistry* **(AI–ST2) [ICT F3–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe chemical reactions of organic compounds.

Communication and Teamwork

Students will:

30–C2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *use advanced menu features within word processing software to insert tables, graphs, text and graphics when preparing a report on an issue related to society's use of organic chemistry* **(CT–SEC2) [ICT P4–4.3]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit D: Chemical Equilibrium Focusing on Acid-Base Systems

Themes: Change, Systems and Equilibrium

Overview: In this unit, the concept that chemical change eventually attains equilibrium is developed, followed by a focus on the quantitative treatment of reaction systems involving acid-base solutions.

This unit builds on:
- Science 8, Unit A: Mix and Flow of Matter
- Science 9, Unit B: Matter and Chemical Change
- Science 10, Unit A: Energy and Matter in Chemical Change
- Chemistry 20, Unit C: Matter as Solutions, Acids and Bases and Unit D: Quantitative Relationships in Chemical Changes

Unit D will require approximately 30% of the time allotted for Chemistry 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit D but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• linear equations	Pure Mathematics 10, specific outcome 2.7; Applied Mathematics 10, specific outcome 5.1
• plotting nonlinear data	Pure Mathematics 10, specific outcome 3.1; Applied Mathematics 10, specific outcome 3.1
• solving nonlinear equations	Pure Mathematics 20, specific outcomes 2.1, 2.3, 2.4, and 3.1
• measurement	Applied Mathematics 10, specific outcomes 1.2 and 1.3; Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: What is happening in a system at equilibrium? How do scientists predict shifts in the equilibrium of a system? How do Brønsted–Lowry acids and bases illustrate equilibrium?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explain that there is a balance of opposing reactions in chemical equilibrium systems
2. determine quantitative relationships in simple equilibrium systems.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- chemical equilibrium systems
- reversibility of reactions
- Le Chatelier's principle
- equilibrium law expression
- equilibrium constants K_c, K_w, K_a, K_b
- acid-base equilibrium
- Brønsted–Lowry acids and bases
- titration curves
- conjugate pairs of acids and bases
- amphiprotic substances
- buffers
- indicators

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General Outcome 1
Students will explain that there is a balance of opposing reactions in chemical equilibrium systems.

Specific Outcomes for Knowledge

Students will:

30–D1.1k define equilibrium and state the criteria that apply to a chemical system in equilibrium; i.e., closed system, constancy of properties, equal rates of forward and reverse reactions

30–D1.2k identify, write and interpret chemical equations for systems at equilibrium

30–D1.3k predict, qualitatively, using Le Chatelier's principle, shifts in equilibrium caused by changes in temperature, pressure, volume, concentration or the addition of a catalyst and describe how these changes affect the equilibrium constant

30–D1.4k define K_c to predict the extent of the reaction and write equilibrium-law expressions for given chemical equations, using lowest whole-number coefficients

30–D1.5k describe Brønsted–Lowry acids as proton donors and bases as proton acceptors

30–D1.6k write Brønsted–Lowry equations, including indicators, and predict whether reactants or products are favoured for acid-base equilibrium reactions for monoprotic and polyprotic acids and bases

30–D1.7k identify conjugate pairs and amphiprotic substances

30–D1.8k define a buffer as relatively large amounts of a weak acid or base and its conjugate in equilibrium that maintain a relatively constant pH when small amounts of acid or base are added.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–D1.1sts explain that the goal of science is knowledge about the natural world **(NS1)**

- *apply equilibrium theories and principles to analyze a variety of phenomena; e.g.,*
  - *carbon dioxide escaping from an open bottle/can of carbonated beverage*
  - *role of the oceans in the carbon cycle*
  - *solubility of oxygen gas in lake water*
  - *acid precipitation (deposition)*
  - *blood gases in deep-sea diving*
  - *buffers in living systems*

30–D1.2sts explain that scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**

- *research how equilibrium theories and principles developed*

30–D1.3sts explain that the goal of technology is to provide solutions to practical problems **(ST1)** **[ICT F2–4.4]**

- *analyze how equilibrium principles have been applied in industrial processes; e.g.,*
  - *Haber–Bosch process for producing ammonia*
  - *Solvay process for producing sodium carbonate*
  - *production of methanol.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain that there is a balance of opposing reactions in chemical equilibrium systems.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–D1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- predict variables that can cause a shift in equilibrium **(IP–NS3)**
- design an experiment to show equilibrium shifts; *e.g., colour change, temperature change, precipitation* **(IP–NS2)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–NS4)**
- *design a procedure to prepare a system capable of buffering* **(PR–ST2)**.

Performing and Recording

Students will:

30–D1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment to test, qualitatively, predictions of equilibrium shifts; *e.g., colour change, temperature change, precipitation and gas production* **(PR–NS3, PR–NS4, PR–NS5)**
- *prepare a buffer and investigate its relative abilities, with a control (i.e., water), to resist a pH change when a small amount of strong acid or strong base is added* **(AI–NS6)**.

Analyzing and Interpreting

Students will:

30–D1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- write the equilibrium law expression for a given equation **(AI–NS1)**
- analyze, qualitatively, the changes in concentrations of reactants and products after an equilibrium shift **(AI–NS6)**
- interpret data from a graph to determine when equilibrium is established and to determine the cause of a stress on the system **(AI–NS2, AI–NS6) [ICT C6–4.1]**
- interpret, qualitatively, titration curves of monoprotic and polyprotic acids and bases for strong acid–weak base and weak acid–strong base combinations, and identify buffering regions **(AI–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain that there is a balance of opposing reactions in chemical equilibrium systems.

Communication and Teamwork

Students will:

30–D1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively to develop an illustration and explanation of reversible reactions* **(CT–ST2)**
- *use advanced menu features within word processing software to insert tables, graphs, text and graphics when developing a group report on equilibrium systems* **(CT–SEC2) [ICT C1–4.4]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will determine quantitative relationships in simple equilibrium systems.

Specific Outcomes for Knowledge

Students will:

30–D2.1k recall the concepts of pH and hydronium ion concentration and pOH and hydroxide ion concentration, in relation to acids and bases

30–D2.2k define K_w, K_a, K_b and use these to determine pH, pOH, $[H_3O^+]$ and $[OH^-]$ of acidic and basic solutions

30–D2.3k calculate equilibrium constants and concentrations for homogeneous systems and Brønsted–Lowry acids and bases (excluding buffers) when

- concentrations at equilibrium are known
- initial concentrations and one equilibrium concentration are known
- the equilibrium constant and one equilibrium concentration are known.

Note: Examples that require the application of the quadratic equation are excluded; however, students may use this method when responding to open-ended questions.

Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

30–D2.1sts explain that technological development may involve the creation of prototypes, the testing of prototypes and the application of knowledge from related scientific and interdisciplinary fields **(ST2)**

- *analyze, on the basis of chemical principles, the application of equilibrium*
  - *industrial processes or medical sciences*
  - *buffering in living systems*
  - *acid precipitation.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will determine quantitative relationships in simple equilibrium systems.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–D2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment to show qualitative equilibrium shifts in concentration under a given set of conditions **(IP–SEC3)**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–NS4)**.

Performing and Recording

Students will:

30–D2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment to show equilibrium shifts in concentration **(PR–NS3) [ICT C6–4.1]**.

Analyzing and Interpreting

Students will:

30–D2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- use experimental data to calculate equilibrium constants **(AI–NS3)**.

Communication and Teamwork

Students will:

30–D2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *use advanced menu features within word processing software to insert tables, graphs, text and graphics when developing a group report on equilibrium applications in Alberta industries* **(CT–SEC2) [ICT C1–4.4]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Effective September 2007, pages 11 to 34 have been **removed** and **replaced** with the **new provincially implemented** Chemistry 20 (2007) Program of Studies.

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PHYSICS 20–30

Provincial Implementation Schedule
Physics 20 September 2007
Physics 30 September 2008

Implementation prior to these dates is **not** approved.

PROGRAM RATIONALE AND PHILOSOPHY

Science programs provide opportunities for students to develop the knowledge, skills and attitudes they need to become productive and responsible members of society. The programs also allow students to explore interests and prepare for further education and careers. Students graduating from Alberta schools require the scientific and related technological knowledge and skills that will enable them to understand and interpret their world. They also need to develop attitudes that will motivate them to use their knowledge and skills in a responsible manner.

To become scientifically literate, students need to develop a knowledge of science and its relationship to technologies and society. They also need to develop the broad-based skills required to identify and analyze problems; to explore and test solutions; and to seek, interpret and evaluate information. To ensure relevance to students as well as to societal needs, a science program must present science in a meaningful context—providing opportunities for students to explore the process of science, its applications and implications, and to examine related technological problems and issues. By doing so, students become aware of the role of science in responding to social and cultural change and in meeting needs for a sustainable environment, economy and society.

Program Vision

The secondary science program is guided by the vision that all students, regardless of gender or cultural background, are given the opportunity to develop scientific literacy. The goal of scientific literacy is to develop in students the science-related knowledge, skills and attitudes that they need to solve problems and make decisions and, at the same time, to help students become lifelong learners who maintain their sense of wonder about the world around them.

Diverse learning experiences within the science program provide students with opportunities to explore, analyze and appreciate the interrelationships among science, technology, society and the environment and to develop understandings that will affect their personal lives, their careers and their futures.

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Goals

The following goals for Canadian science education, developed in the *Common Framework of Science Learning Outcomes K to 12: Pan-Canadian Protocol for Collaboration on School Curriculum* (1997), are addressed through the Alberta science program. Science education will:

- encourage students at all grade levels to develop a critical sense of wonder and curiosity about scientific and technological endeavours
- enable students to use science and technology to acquire new knowledge and solve problems so that they may improve the quality of their lives and the lives of others
- prepare students to critically address science-related societal, economic, ethical and environmental issues
- provide students with a foundation in science that creates opportunities for them to pursue progressively higher levels of study, prepares them for science-related occupations and engages them in science-related hobbies appropriate to their interests and abilities
- develop in students of varying aptitudes and interests a knowledge of the wide spectrum of careers related to science, technology and the environment.

Aboriginal Perspectives

Courses in the senior high school sciences incorporate Aboriginal perspectives in order to develop, in all students, an appreciation of the cultural diversity and achievements of First Nations, Métis and Inuit (FNMI) peoples. These courses are designed to:

- acknowledge the contributions of Aboriginal peoples to understandings of the natural world
- support relational thinking by integrating learning from various disciplines of science
- develop the concept of humankind's connectivity to the natural world and foster an appreciation for the importance of caring for the environment
- foster the development of positive attitudes by providing experiences that encourage all students to feel confident about their ability to succeed in science.

Information and Communication Technology (ICT)

Selected curriculum outcomes from Alberta Education's Information and Communication Technology (ICT) Program of Studies are infused throughout the 20-level and 30-level sciences so that students will develop a broad perspective on the nature of technology, learn how to use and apply a variety of technologies, and consider the impact of ICT on individuals and society. The infusion of ICT outcomes supports and reinforces the understandings and abilities that students are expected to develop within Foundation 3 (Science, Technology and Society) and Foundation 4 (Skills) of these courses. Effective, efficient and ethical application of ICT outcomes contributes to the program vision.

Infusion of ICT outcomes provides learning opportunities for students to:

- understand the nature of technology and apply terminology appropriately
- use equipment carefully and share limited ICT resources
- use technology in an ethical manner, including respecting the ownership of information and digital resources and citing electronic sources
- use technology safely, including applying ergonomic principles and appropriate safety procedures
- use the Internet safely, including protecting personal information and avoiding contact with strangers
- use technology appropriately, including following communication etiquette and respecting the privacy of others.

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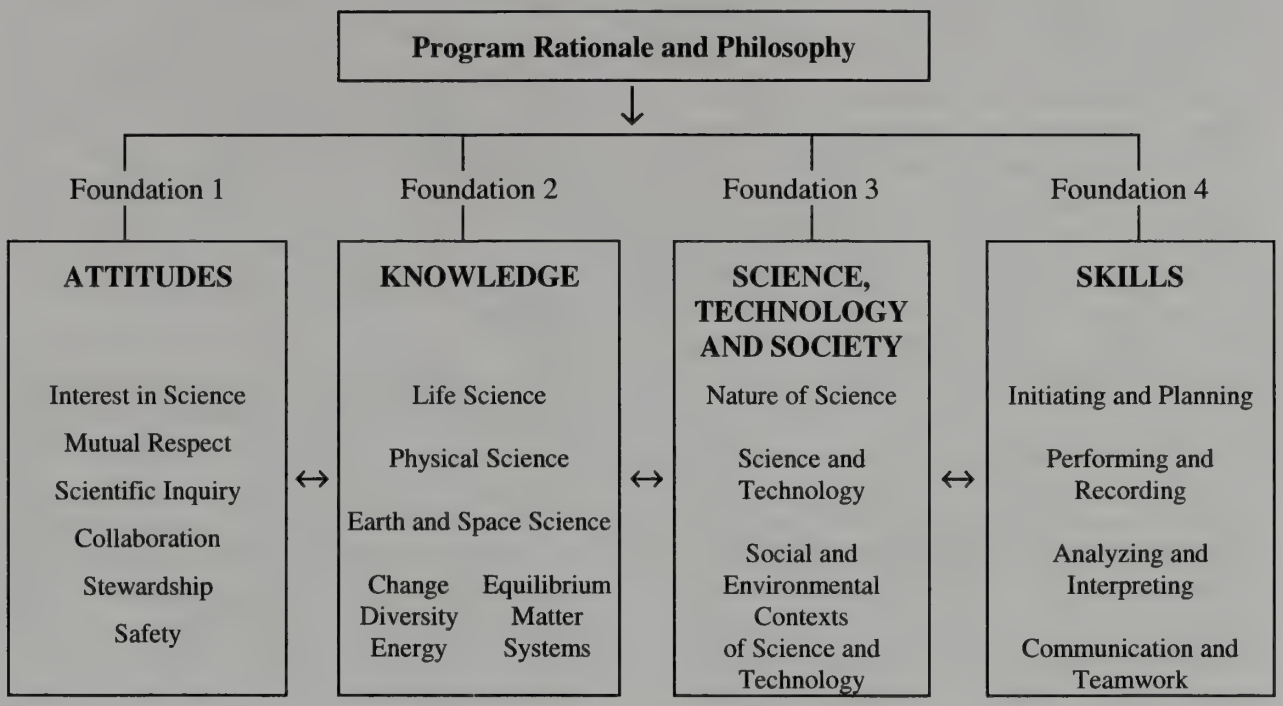
PROGRAM FOUNDATIONS

To support the development of scientific literacy, a science program must provide learning experiences that address critical aspects of science and its application. These foundations provide a general direction for the program and identify the major components of its structure.



Foundation 1
Attitudes—*Students will be encouraged to* develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society and the environment.

Foundation 2
Knowledge—*Students will* construct knowledge and understandings of concepts in life science, physical science and Earth and space science, and apply these understandings to interpret, integrate and extend their knowledge.

Foundation 3
Science, Technology and Society (STS)—*Students will* develop an understanding of the nature of science and technology, the relationships between science and technology, and the social and environmental contexts of science and technology.

Foundation 4
Skills—*Students will* develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively and for making informed decisions.

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Foundation 1: Attitudes

Foundation 1 is concerned with the generalized aspects of behaviour that are commonly referred to as attitudes. Attitude outcomes are of a different form than outcomes for skills and knowledge: they are exhibited in a different way, and they are rooted more deeply in the experiences that students bring to school. Attitude development is a lifelong process that involves the home, the school, the community and society at large. Attitudes are best shown not by the events of a particular moment but by the pattern of behaviours over time. Development of positive attitudes plays an important role in student growth by interacting with students' intellectual development and by creating a readiness for responsible application of what is learned.

Interest in Science

Students will be encouraged to develop enthusiasm and continuing interest in the study of science.

Mutual Respect

Students will be encouraged to appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds.

Scientific Inquiry

Students will be encouraged to develop attitudes that support active inquiry, problem solving and decision making.

Collaboration

Students will be encouraged to develop attitudes that support collaborative activity.

Stewardship

Students will be encouraged to develop responsibility in the application of science and technology in relation to society and the natural environment.

Safety

Students will be encouraged to demonstrate a concern for safety in science and technology contexts.

Foundation 2: Knowledge

Foundation 2 focuses on the subject matter of science, including the laws, theories, models, concepts and principles that are essential to an understanding of each science area. For organizational purposes, this foundation is framed using widely accepted science disciplines.

Life Science

Life science deals with the growth and interactions of life forms within their environments in ways that reflect their uniqueness, diversity, genetic continuity and changing nature. Life science includes such fields of study as ecosystems, biological diversity, organisms, cells, biochemistry, genetic engineering and biotechnology.

Physical Science

Physical science, which encompasses chemistry and physics, deals with matter, energy and forces. Matter has structure, and there are interactions among its components. Energy links matter to gravitational, electromagnetic and nuclear forces in the universe. Physical science also addresses the conservation laws of mass and energy, momentum and charge.

Earth and Space Science

Earth and space science brings global and universal perspectives to student knowledge. The planet Earth exhibits form, structure and patterns of change, as does the surrounding solar system and the physical universe beyond it. Earth and space science includes such fields of study as geology, meteorology and astronomy.

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Themes are the major ideas of science and technology that transcend discipline boundaries and demonstrate unity among the natural sciences. Six themes have been identified for the senior high school sciences program.

Change
Students will develop an understanding of:

How all natural entities are modified over time, how the direction of change might be predicted and, in some instances, how change can be controlled.

Diversity
Students will develop an understanding of:

The array of living and nonliving forms of matter and the procedures used to understand, classify and distinguish these forms of matter on the basis of recurring patterns.

Energy
Students will develop an understanding of:

The capacity for doing work that drives much of what takes place in the universe through its variety of interconvertible forms.

Equilibrium
Students will develop an understanding of:

The state in which opposing forces or processes balance in a static or dynamic way.

Matter
Students will develop an understanding of:

The constituent parts, and the variety of states, of the material in the physical world.

Systems
Students will develop an understanding of:

The interrelated groups of things or events that can be defined by their boundaries and, in some instances, by their inputs and outputs.

Foundation 3: Science, Technology and Society (STS)

Foundation 3 is concerned with understanding the scope and character of science, its connections to technology and the social context in which it is developed. The following is a brief introduction to the major ideas underlying this component of the program.

Nature of Science

Science provides an ordered way of learning about the nature of things, based on observation and evidence. Through science, we explore our environment, gather knowledge and develop ideas that help us interpret and explain what we see. Scientific activity provides a conceptual and theoretical base that is used in predicting, interpreting and explaining natural and technological phenomena. Science is driven by a combination of specific knowledge, theory, observation and experimentation. Science-based ideas are continually being tested, modified and improved as new knowledge and explanations supersede existing knowledge and explanations.

Science and Technology

Technology is concerned with solving practical problems that arise from human needs. Historically, the development of technology has been strongly linked to the development of science, with each making contributions to the other. While there are important relationships and interdependencies, there are also important differences. Whereas the focus of science is on the development and verification of knowledge, the focus of technology is on the development of solutions, involving devices and systems that meet a given need within the constraints of a problem. The test of scientific knowledge is that it helps us explain, interpret and predict; the test of technology is that it works—it enables us to achieve a given purpose.

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Social and Environmental Contexts

The history of science shows that scientific development takes place within a social context. Many examples can be used to show that cultural and intellectual traditions have influenced the focus and methodologies of science, and that science in turn has influenced the wider world of ideas.

Today, research is often driven by societal and environmental needs and issues. As technological solutions have emerged from previous research, many of the new technologies have given rise to complex social and environmental issues. Increasingly, these issues are becoming part of the political agenda. The potential of science to inform and empower decision making by individuals, communities and society is central to scientific literacy in a democratic society.

Foundation 4: Skills

Foundation 4 is concerned with the skills that students develop in answering questions, solving problems and making decisions. While these skills are not unique to science, they play an important role in the development of scientific understandings and in the application of science and technology to new situations. Four broad skill areas are outlined in the secondary science program. Each skill area is developed at each level with increasing scope and complexity of application.

Initiating and Planning

These are the skills of questioning, identifying problems and developing preliminary ideas and plans.

Performing and Recording

These are the skills of carrying out a plan of action that include gathering evidence by observation and, in most cases, manipulating materials and equipment.

Analyzing and Interpreting

These are the skills of examining information and evidence; of processing and presenting data so that they can be interpreted; and of interpreting, evaluating and applying the results.

Communication and Teamwork

In science, as in other areas, communication skills are essential at every stage during which ideas are being developed, tested, interpreted, debated and agreed upon. Teamwork skills are also important, as the development and application of science ideas are collaborative processes both in society and in the classroom.

PROGRAM ORGANIZATION

Attitude Outcomes

A listing of Attitude outcomes is included at the beginning of each of the 20-level and 30-level courses in the senior high school sciences program. These specific outcomes are to be developed throughout the particular course in conjunction with the specific outcomes for Knowledge, STS and Skills listed within each unit of study.

Units of Study

In the senior high school sciences program, four units of study are outlined for each course. Each unit in the 20-level and 30-level courses includes the following components.

Themes

Themes are the major ideas of science that transcend topics of study.

Overview

The overview introduces the contents of the unit and suggests an approach to unit development.

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Links to Mathematics

This section lists topics from mathematics programs of study that are related to the science content of the unit.

Focusing Questions

These questions frame a context for introducing the unit and suggest a focus for investigative activities and application of ideas by students.

Key Concepts

Key concepts identify major ideas to be developed in the unit. Some of the concepts may be addressed in additional units of the same course, as well as in other courses. The intended scope of treatment of these concepts is indicated by the outcomes.

Outcomes

Two levels of outcomes are provided in each unit:

- General Outcomes: These are the major outcomes in the unit that students are to demonstrate over the course of their learning.
- Specific Outcomes: These are detailed outcomes that delineate the scope of each general outcome and the unit. Specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills are identified.

The outcomes are numbered for the purpose of referencing. This numbering is not intended to imply a fixed instructional sequence.

Examples

Many of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

STS Emphases

The specific outcomes for Science, Technology and Society (STS) and Skills for each general outcome in a unit include one of the following emphases:

- Nature of Science
- Science and Technology
- Social and Environmental Contexts

The STS emphases provide opportunities for students to develop related concepts and skills as outlined on pages 8 to 10.

Additional Links

Links to the STS emphasis frameworks (pages 8 to 10) are shown in **boldface** and (in parentheses) after specific outcomes for STS and after specific outcomes or examples for Skills. Links to the Division 4 ICT curriculum (pages 11 to 13) are shown in **boldface** and [in brackets] after some of the specific outcomes and examples for STS and Skills. The STS and ICT links indicate that the concept or skill from the STS emphasis framework or the Division 4 ICT outcome has been addressed in the specific outcome or example.

Note: The listing of STS and ICT links is not exhaustive; other links may exist.

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Framework for Developing a Nature of Science Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on how scientific knowledge is developed)

Students will develop an understanding that:

- the goal of science is knowledge about the natural world **(NS1)**
- scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**
- scientific knowledge results from peer review and replication of the research of others **(NS3)**
- scientific knowledge is subject to change as new evidence becomes apparent and as laws and theories are tested and subsequently revised, reinforced or rejected **(NS4)**
- the process of scientific investigation includes **(NS5)**:
  - identifying the theoretical basis of the investigation **(NS5a)**
  - defining and delimiting, clearly, research questions or ideas to be tested **(NS5b)**
  - designing the investigation **(NS5c)**
  - evaluating and selecting means to collect and record evidence **(NS5d)**
  - carrying out the investigation **(NS5e)**
  - analyzing the evidence and providing explanations based upon scientific theories and concepts **(NS5f)**
- scientific paradigms are conceptual inventions that help organize, interpret and explain findings **(NS6)**
  - Concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**
  - Conventions of mathematics, nomenclature and notation provide a basis for organizing and communicating scientific theory, relationships and concepts; e.g., chemical symbols **(NS6b)**
  - Scientific language is precise, and specific terms may be used in each field of study **(NS6c)**
- scientific inquiry is limited to certain questions **(NS7)**

Skills (focus on scientific inquiry)

Initiating and Planning **(IP–NS)**

Students will:

- identify, define and delimit questions to investigate **(IP–NS1)**
- design an experiment, identifying and controlling major variables **(IP–NS2)**
- state a prediction and a hypothesis based on available evidence or background information or on a theory **(IP–NS3)**
- evaluate and select appropriate procedures, including appropriate sampling procedures, and instruments for collecting evidence and information **(IP–NS4)**

Performing and Recording **(PR–NS)**

Students will:

- research, integrate and synthesize information from various print and electronic sources regarding a scientific question **(PR–NS1)**
- select and use appropriate instruments for collecting data effectively, safely and accurately **(PR–NS2)**
- carry out procedures, controlling the major variables, and adapt or extend procedures where required **(PR–NS3)**
- compile and organize findings and data by hand or computer, using appropriate formats such as diagrams, flowcharts, tables and graphs **(PR–NS4)**
- apply Workplace Hazardous Materials Information System (WHMIS) standards to handle and dispose of materials **(PR–NS5)**

Analyzing and Interpreting **(AI–NS)**

Students will:

- apply appropriate terminology, classification systems and nomenclature used in the sciences **(AI–NS1)**
- interpret patterns and trends in data and predict the value of a variable by interpolating or extrapolating from graphical data or from a line of best fit **(AI–NS2)**
- estimate and calculate the value of variables, compare theoretical and empirical values, and account for discrepancies **(AI–NS3)**
- identify limitations of data or measurements; explain sources of error; and evaluate the relevance, reliability and adequacy of data and data collection methods **(AI–NS4)**
- identify new questions or problems that arise from what was learned **(AI–NS5)**
- state a conclusion, based on data obtained from investigations, and explain how evidence gathered supports or refutes a hypothesis, prediction or theory **(AI–NS6)**

Communication and Teamwork **(CT–NS)**

Students will:

- work collaboratively to develop and carry out investigations **(CT–NS1)**
- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**
- evaluate individual and group processes used in planning and carrying out investigative tasks **(CT–NS3)**

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Framework for Developing a Science and Technology Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on the interrelationship of science and technology)

Students will develop an understanding that:

- the goal of technology is to provide solutions to practical problems **(ST1)**
- technological development may involve the creation of prototypes, the testing of prototypes and the application of knowledge from related scientific and interdisciplinary fields **(ST2)**
- technological problems often require multiple solutions that involve different designs, materials and processes and that have both intended and unintended consequences **(ST3)**
- scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4)**
- the process for technological development includes **(ST5)**:
  - defining and delimiting, clearly, the problems to be solved and establishing criteria to assess the technological solution **(ST5a)**
  - identifying the constraints, the benefits and the drawbacks **(ST5b)**
  - developing designs and prototypes **(ST5c)**
  - testing and evaluating designs and prototypes on the basis of established criteria **(ST5d)**
- the products of technology are devices, systems and processes that meet given needs; however, these products cannot solve all problems **(ST6)**
- the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7)**

Skills (focus on problem solving)

Initiating and Planning **(IP–ST)**

Students will:

- identify questions to investigate arising from practical problems **(IP–ST1)**
- propose and assess alternative solutions to a given practical problem, select one and develop a plan **(IP–ST2)**
- evaluate and select appropriate procedures and instruments for collecting data and information and for solving problems **(IP–ST3)**

Performing and Recording **(PR–ST)**

Students will:

- research, integrate and synthesize information from various print and electronic sources relevant to a practical problem **(PR–ST1)**
- construct and test a prototype device or system and troubleshoot problems as they arise **(PR–ST2)**
- select and use tools, apparatus and materials safely **(PR–ST3)**

Analyzing and Interpreting **(AI–ST)**

Students will:

- evaluate designs and prototypes on the basis of self-developed criteria; e.g., function, reliability, cost, safety, efficient use of materials, impact on the environment **(AI–ST1)**
- analyze alternative solutions to a given problem, identify potential strengths and weaknesses of each and recommend an approach to solving the problem, based on findings **(AI–ST2)**
- solve problems by selecting appropriate technology to perform manipulations and calculations **(AI–ST3)**
- identify new questions and problems that arise from what was learned and evaluate potential applications of findings **(AI–ST4)**

Communication and Teamwork **(CT–ST)**

Students will:

- work collaboratively to test a prototype device or system and troubleshoot problems as they arise **(CT–ST1)**
- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–ST2)**
- evaluate individual and group processes used in planning and carrying out problem-solving tasks **(CT–ST3)**

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Framework for Developing a Social and Environmental Contexts Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on issues related to the application of science and technology)

Students will develop an understanding that:

- science and technology are developed to meet societal needs and expand human capability **(SEC1)**
- science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2)**
- science and technology have both intended and unintended consequences for humans and the environment **(SEC3)**
- society provides direction for scientific and technological development **(SEC4)**
  - Canadian society supports scientific research and technological development to facilitate a sustainable society, economy and environment **(SEC4a)**
  - Decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b)**
  - Society supports scientific and technological development by recognizing accomplishments, publishing and disseminating results and providing financial support **(SEC4c)**
- scientific and technological activity may arise from, and give rise to, such personal and social values as accuracy, honesty, perseverance, tolerance, open-mindedness, critical-mindedness, creativity and curiosity **(SEC5)**
- science and technology provide opportunities for a diversity of careers based on post-secondary studies, for the pursuit of hobbies and interests, and for lifelong learning **(SEC6)**

Skills (focus on applying science to inform decision-making processes)

Initiating and Planning **(IP–SEC)**
Students will:

- identify questions to investigate that arise from issues related to the application of science and technology **(IP–SEC1)**
- plan complex searches for information, using a wide variety of electronic and print sources **(IP–SEC2)**
- assess and develop appropriate processes for collecting relevant data and information about science-and-technology-related issues **(IP–SEC3)**

Performing and Recording **(PR–SEC)**
Students will:

- research, integrate and synthesize information from various print and electronic sources relevant to a given question, problem or issue **(PR–SEC1)**
- select information and gather evidence from appropriate sources and evaluate search strategies **(PR–SEC2)**

Analyzing and Interpreting **(AI–SEC)**
Students will:

- apply given criteria for evaluating evidence and assess the authority, reliability, scientific accuracy and validity of sources of information **(AI–SEC1)**
- apply a variety of perspectives in assessing the risks and benefits of scientific and technological developments **(AI–SEC2)**
- assess potential decisions and recommend the best one, based on findings **(AI–SEC3)**
- identify new questions that arise and evaluate, from a variety of perspectives, potential implications of findings **(AI–SEC4)**

Communication and Teamwork **(CT–SEC)**
Students will:

- work collaboratively to investigate a science-and-technology-related issue **(CT–SEC1)**
- communicate in a persuasive and an engaging manner, using appropriate multimedia forms, to further understand a complex science-and-technology-related issue **(CT–SEC2)**
- make clear and logical arguments to defend a given decision on an issue, based on findings **(CT–SEC3)**
- evaluate individual and group processes used in investigating an issue and in evaluating alternative decisions **(CT–SEC4)**

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Division 4 ICT Outcomes

Category: Communicating, Inquiring, Decision Making and Problem Solving

General Outcomes	Specific Outcomes
C1 **Students will access, use and communicate information from a variety of technologies.**	C1 4.1 plan and perform complex searches, using more than one electronic source 4.2 select information from appropriate sources, including primary and secondary sources 4.3 evaluate and explain the advantages and disadvantages of various search strategies 4.4 communicate in a persuasive and engaging manner, through appropriate forms, such as speeches, letters, reports and multimedia presentations, applying information technologies for context, audience and purpose that extend and communicate understanding of complex issues
C2 **Students will seek alternative viewpoints, using information technologies.**	C2 4.1 consult a wide variety of sources that reflect varied viewpoints on particular topics 4.2 evaluate the validity of gathered viewpoints against other sources
C3 **Students will critically assess information accessed through the use of a variety of technologies.**	C3 4.1 assess the authority, reliability and validity of electronically accessed information 4.2 demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic
C4 **Students will use organizational processes and tools to manage inquiry.**	C4 4.1 use calendars, time management or project management software to assist in conducting an inquiry
C5 **Students will use technology to aid collaboration during inquiry.**	C5 4.1 use telecommunications to pose critical questions to experts 4.2 participate in a variety of electronic group formats
C6 **Students will use technology to investigate and/or solve problems.**	C6 4.1 investigate and solve problems of prediction, calculation and inference 4.2 investigate and solve problems of organization and manipulation of information 4.3 manipulate data by using charting and graphing technologies in order to test inferences and probabilities 4.4 generate new understandings of problematic situations by using some form of technology to facilitate the process 4.5 evaluate the appropriateness of the technology used to investigate or solve a problem
C7 **Students will use electronic research techniques to construct personal knowledge and meaning.**	C7 4.1 use appropriate strategies to locate information to meet personal needs 4.2 analyze and synthesize information to determine patterns and links among ideas 4.3 use appropriate presentation software to demonstrate personal understandings

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Division 4 ICT Outcomes (continued)

Category: Foundational Operations, Knowledge and Concepts

General Outcomes	Specific Outcomes
F1 **Students will demonstrate an understanding of the nature of technology.**	**F1** 4.1 assess the strengths and weaknesses of computer simulations in relation to real-world problems 4.2 solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments 4.3 apply terminology appropriate to technology in all forms of communication 4.4 demonstrate an understanding of the general concepts of computer programming and the algorithms that enable technological devices to perform operations and solve problems
F2 **Students will understand the role of technology as it applies to self, work and society.**	**F2** 4.1 use technology outside formal classroom settings 4.2 analyze how technological innovations and creativity affect the economy 4.3 demonstrate an understanding of new and emerging communication systems 4.4 evaluate possible potential for emerging technologies 4.5 demonstrate conservation measures when using technology 4.6 demonstrate an understanding of the basic principles and issues of e-commerce, including such topics as security and privacy, marketing, and implications for governments, businesses and consumers alike 4.7 use current, reliable information sources from around the world 4.8 analyze and assess the impact of technology on the global community
F3 **Students will demonstrate a moral and ethical approach to the use of technology.**	**F3** 4.1 demonstrate an understanding of how changes in technology can benefit or harm society 4.2 record relevant data for acknowledging sources of information, and cite sources correctly 4.3 respect ownership and integrity of information
F4 **Students will become discerning consumers of mass media and electronic information.**	**F4** 4.1 discriminate between style and content in a presentation 4.2 evaluate the influence and results of digital manipulation on our perceptions 4.3 identify and analyze a variety of factors that affect the authenticity of information derived from mass media and electronic communication
F5 **Students will practise the concepts of ergonomics and safety when using technology.**	**F5** 4.1 assess new physical environments with respect to ergonomics 4.2 identify safety regulations specific to the technology being used
F6 **Students will demonstrate a basic understanding of the operating skills required in a variety of technologies.**	**F6** 4.1 continue to demonstrate the outcomes addressed within the previous divisions. Students interested in pursuing advanced study in such areas as electronics, programming, computer-aided design and drafting (CADD), robotics and other industrial applications of technology will find opportunities in Career and Technology Studies (CTS) courses

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Division 4 ICT Outcomes (continued)

Category: Processes for Productivity

General Outcomes	Specific Outcomes
P1 **Students will compose, revise and edit text.**	**P1** 4.1 continue to demonstrate the outcomes achieved in prior grades and course subjects
P2 **Students will organize and manipulate data.**	**P2** 4.1 manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets
P3 **Students will communicate through multimedia.**	**P3** 4.1 select and use, independently, multimedia capabilities for presentations in various subject areas 4.2 support communication with appropriate images, sounds and music 4.3 apply general principles of graphic layout and design to a document in process
P4 **Students will integrate various applications.**	**P4** 4.1 integrate a variety of visual and audio information into a document to create a message targeted for a specific audience 4.2 apply principles of graphic design to enhance meaning and audience appeal 4.3 use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text
P5 **Students will navigate and create hyperlinked resources.**	**P5** 4.1 create multiple-link documents appropriate to the content of a particular topic 4.2 post multiple-link pages on the World Wide Web or on a local or wide area network
P6 **Students will use communication technology to interact with others.**	**P6** 4.1 select and use the appropriate technologies to communicate effectively with a targeted audience

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PHYSICS 20

Physics 20 consists of four units of study:

A. Kinematics
B. Dynamics
C. Circular Motion, Work and Energy
D. Oscillatory Motion and Mechanical Waves

Attitude Outcomes

Students will be encouraged to develop positive attitudes that support the responsible acquisition and application of knowledge related to science and technology. The following attitude outcomes are to be developed throughout Physics 20, in conjunction with the specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills in each unit.

Interest in Science

Students will be encouraged to:
show interest in science-related questions and issues and confidently pursue personal interests and career possibilities within science-related fields; *e.g.,*

- *research the answers to questions they generate*
- *explore and use a variety of methods and resources to increase their knowledge and skills*
- *be critical and constructive when considering new theories and techniques*
- *use scientific vocabulary and principles in everyday discussions*
- *recognize the usefulness of being skilled in mathematics and problem solving*
- *be interested in science and technology topics not directly related to their formal studies*
- *recognize the importance of making connections among various science disciplines*
- *maintain interest in pursuing further studies in science*
- *explore where further science- and technology-related studies and careers can be pursued*
- *recognize that many careers require science- and technology-related knowledge and skills.*

Mutual Respect

Students will be encouraged to:
appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds; *e.g.,*

- *use a multiperspective approach, considering scientific, technological, economic, cultural, political and environmental factors when formulating conclusions, solving problems or making decisions on an STS issue*
- *research carefully and discuss openly ethical dilemmas associated with the applications of science and technology*
- *explore personal perspectives, attitudes and beliefs toward scientific and technological advancements*
- *recognize the contribution of science and technology to the progress of civilizations*
- *show support for the development of technologies and science as they relate to human needs*
- *recognize that the scientific approach is one of many ways of viewing the universe*
- *recognize the research contributions of both men and women*
- *recognize the research contributions of Canadians.*

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Scientific Inquiry

Students will be encouraged to:
seek and apply evidence when evaluating alternative approaches to investigations, problems and issues; *e.g.,*

- *consider the social and cultural contexts in which a theory developed*
- *appreciate how scientific problem solving and the development of new technologies are related*
- *insist on evidence before accepting a new idea or a new explanation*
- *assess, critically, their opinion of the value of science and its applications*
- *question arguments in which evidence, explanations or positions do not reflect the diversity of existing perspectives*
- *criticize arguments that are based on the faulty, incomplete or misleading use of numbers*
- *recognize the importance of reviewing the basic assumptions from which a line of inquiry has arisen*
- *insist that the critical assumptions behind any line of reasoning be made explicit so that the validity of the position taken can be judged*
- *evaluate inferences and conclusions, being cognizant of the many variables involved in experimentation*
- *ask questions and conduct research to ensure understanding*
- *expend the effort and time needed to make valid inferences*
- *seek new models, explanations and theories when confronted with discrepant events.*

Collaboration

Students will be encouraged to:
work collaboratively in planning and carrying out investigations and in generating and evaluating ideas; *e.g.,*

- *provide the same attention and energy to the group's product as they would to a personal assignment*
- *be attentive when others speak, seek the point of view of others, and consider a multitude of perspectives*
- *use appropriate communication technology to elicit feedback from others*
- *participate in a variety of electronic group formats.*

Stewardship

Students will be encouraged to:
demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment; *e.g.,*

- *assume part of the collective responsibility for the impact of humans on the environment*
- *participate in civic activities related to the preservation and judicious use of the environment and its resources*
- *encourage their peers or members of their community to participate in a project related to sustainability*
- *consider all perspectives when addressing issues, weighing scientific, technological and ecological factors*
- *discuss both the positive and negative effects of environmental changes caused by nature and by humans on human beings and society*
- *participate in the social and political systems that influence environmental policy in their community*
- *promote actions that are not injurious to the environment*

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- *make personal decisions based on a feeling of responsibility toward less privileged parts of the global community and toward future generations*
- *be critical-minded regarding the short- and long-term consequences of sustainability.*

Safety

Students will be encouraged to:
show concern for safety in planning, carrying out and reviewing activities, referring to the Workplace Hazardous Materials Information System (WHMIS) and consumer product labelling information; *e.g.,*

- *consider safety a positive limiting factor in scientific and technological endeavours*
- *read the labels on materials before using them, interpret the WHMIS symbols and consult a reference document if safety symbols are not understood*
- *manipulate materials carefully, being cognizant of the risks and consequences of their actions*
- *assume responsibility for the safety of all those who share a common working environment, by cleaning up after an activity and disposing of materials according to safety guidelines*
- *seek assistance immediately for any first-aid concerns, such as cuts, burns or unusual reactions*
- *keep the work station uncluttered, ensuring that only appropriate laboratory materials are present*
- *criticize a procedure, a design or materials that are not safe or that could have a negative impact on the environment*
- *use safety and waste disposal as criteria for evaluating an experiment*
- *write safety and waste-disposal precautions into a laboratory procedure.*

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Unit A: Kinematics

Themes: Change and Systems

Overview: In this unit, students investigate changes in the position and velocity of objects and systems in a study of kinematics.

This unit builds on:
- Grade 7 Science, Unit D: Structures and Forces
- Grade 8 Science, Unit D: Mechanical Systems
- Science 10, Unit B: Energy Flow in Technological Systems

This unit prepares students for further study, in subsequent units and physics courses, of dynamics, Newton's laws and particles in gravitational, electric and magnetic fields.

Unit A will require approximately 15% of the time allotted for Physics 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit A but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• trigonometric ratios and triangle solutions	Pure Mathematics 10, specific outcomes 6.1 to 6.3; Applied Mathematics 10, specific outcomes 6.1 to 6.3
• properties of linear functions	Pure Mathematics 10, specific outcome 4.6; Applied Mathematics 10, specific outcomes 5.1, 5.2 and 5.7
• graphing quadratic functions from experimental data	Pure Mathematics 20, specific outcomes 2.3 and 2.4; Applied Mathematics 20, specific outcomes 2.1 and 2.3
• vector components and vector addition	Pure Mathematics 10, specific outcomes 6.1 and 6.3; Applied Mathematics 30, specific outcomes 5.1 to 5.4

Note: The use of systems of equations, the quadratic formula and trigonometric ratios for angles greater than 90° is not required.

Focusing Questions: How do changes in position, velocity and acceleration allow us to predict the paths of moving objects and systems? How do the principles of kinematics influence the development of new mechanical technologies?

General Outcomes: There is one major outcome in this unit.

Students will:

1. describe motion in terms of displacement, velocity, acceleration and time.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.
- scalar quantities
- vector quantities
- uniform motion
- uniformly accelerated motion
- two-dimensional motion

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General Outcome 1
Students will describe motion in terms of displacement, velocity, acceleration and time.

Specific Outcomes for Knowledge

Students will:

20–A1.1k define, qualitatively and quantitatively, displacement, velocity and acceleration

20–A1.2k define, operationally, and compare and contrast scalar and vector quantities

20–A1.3k explain, qualitatively and quantitatively, uniform and uniformly accelerated motion when provided with written descriptions and numerical and graphical data

20–A1.4k interpret, quantitatively, the motion of one object relative to another, using displacement and velocity vectors

20–A1.5k explain, quantitatively, two-dimensional motion in a horizontal or vertical plane, using vector components.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–A1.1sts explain that the goal of science is knowledge about the natural world **(NS1)**

- *identify common applications of kinematics, such as determining the average speed of a run, bike ride or car trip, or the acceleration required to launch an aircraft from a carrier*

20–A1.2sts explain that scientific knowledge is subject to change as new evidence becomes apparent and as laws and theories are tested and subsequently revised, reinforced or rejected **(NS4)**

- *analyze lunar free fall as illustrated in a video*

20–A1.3sts explain that the process for technological development includes testing and evaluating designs and prototypes on the basis of established criteria **(ST5d) [ICT C6–4.5]**

- *investigate the application of kinematics principles, such as determining the appropriate length of airport runways, the design of merging lanes or the timing of traffic lights.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will describe motion in terms of displacement, velocity, acceleration and time.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–A1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- identify, define and delimit questions to investigate; *e.g., What are the relationships among displacement, velocity, acceleration and time?* **(IP–NS1)**
- *explain why distances are measured in different units (as the crow flies, days of travel, mileage from city centre to city centre, light years).*

Performing and Recording

Students will:

20–A1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment to demonstrate the relationships among displacement, velocity, acceleration and time, using available technologies; *e.g., interval timers, photo gates* **(PR–NS2, PR–NS3) [ICT C6–4.4]**
- collect information from various print and electronic sources to explain the use of kinematics concepts; *e.g., the synchronization of traffic lights* **(PR–ST1) [ICT C1–4.1]**.

Analyzing and Interpreting

Students will:

20–A1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- construct graphs to demonstrate the relationships among displacement, velocity, acceleration and time for uniform and uniformly accelerated motion **(AI–NS2)**
- analyze a graph of empirical data to infer the mathematical relationships among displacement, velocity, acceleration and time for uniform and uniformly accelerated motion **(AI–NS2) [ICT C7–4.2]**
- solve, quantitatively, projectile motion problems near Earth's surface, ignoring air resistance **(AI–NS3) [ICT C6–4.1]**
- relate acceleration to the slope of, and displacement to the area under, a velocity-time graph **(AI–NS2, AI–NS6) [ICT C7–4.2]**
- *analyze uniform motion examples, using computer simulations* **(AI–NS3) [ICT C6–4.4]**.

Communication and Teamwork

Students will:

20–A1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate International System of Units (SI) notation, fundamental and derived units and significant digits **(CT–NS2)**★
- use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate ideas, plans and results **(CT–NS2)**★
- use delta notation correctly when describing changes in quantities **(CT–NS2)**★.

★To be developed throughout the course.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit B: Dynamics

Themes: Change and Systems

Overview: In this unit, students investigate causes of change in the position and velocity of objects and systems in a study of dynamics and gravitation. The concept of fields is introduced in the explanation of gravitational effects.

This unit builds on:
- Grade 7 Science, Unit D: Structures and Forces
- Grade 8 Science, Unit D: Mechanical Systems
- Science 10, Unit B: Energy Flow in Technological Systems
- Physics 20, Unit A: Kinematics

This unit prepares students for further study, in subsequent units and physics courses, of Newton's laws, periodic motion and particles in electric and magnetic fields.

Unit B will require approximately 25% of the time allotted for Physics 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit B but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• properties of linear functions	Pure Mathematics 10, specific outcome 4.6; Applied Mathematics 10, specific outcomes 5.1, 5.2 and 5.7
• graphing quadratic functions	Pure Mathematics 20, specific outcomes 2.3 and 2.4; Applied Mathematics 20, specific outcomes 2.1 and 2.3
• graphing inverse-square functions	Pure Mathematics 10, specific outcome 3.1; Applied Mathematics 10, specific outcome 3.1
• vector components and vector addition	Pure Mathematics 10, specific outcomes 6.1 and 6.3; Applied Mathematics 30, specific outcomes 5.1 to 5.4

Note: The use of systems of equations, the quadratic formula and trigonometric ratios for angles greater than 90° is not required.

Focusing Questions: How does the understanding of forces help humans improve or change their environment? How do the principles of dynamics influence the development of new mechanical technologies? What role do gravitational effects play in the universe?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explain the effects of balanced and unbalanced forces on velocity
2. explain that gravitational effects extend throughout the universe.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.
- Newton's laws of motion
- inertia
- vector addition
- static and kinetic friction
- gravitational force
- Newton's law of universal gravitation
- gravitational field

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General Outcome 1
Students will explain the effects of balanced and unbalanced forces on velocity.

Specific Outcomes for Knowledge

Students will:

20–B1.1k explain that a nonzero net force causes a change in velocity

20–B1.2k apply Newton's first law of motion to explain, qualitatively, an object's state of rest or uniform motion

20–B1.3k apply Newton's second law of motion to explain, qualitatively, the relationships among net force, mass and acceleration

20–B1.4k apply Newton's third law of motion to explain, qualitatively, the interaction between two objects, recognizing that the two forces, equal in magnitude and opposite in direction, do not act on the same object

20–B1.5k explain, qualitatively and quantitatively, static and kinetic forces of friction acting on an object

20–B1.6k calculate the resultant force, or its constituents, acting on an object by adding vector components graphically and algebraically

20–B1.7k apply Newton's laws of motion to solve, algebraically, linear motion problems in horizontal, vertical and inclined planes near the surface of Earth, ignoring air resistance.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

20–B1.1sts explain that the goal of technology is to provide solutions to practical problems, that technological development includes testing and evaluating designs and prototypes on the basis of established criteria, and that the products of technology cannot solve all problems **(ST1, ST5d, ST6) [ICT F2–4.4]**

- *assess the design and use of injury-prevention devices in cars and sports in terms of Newton's laws of motion*
- *explain how buffalo jumps represented a technological solution to food supply problems and describe the advantages and limitations of such a technique*

20–B1.2sts explain that science and technology are developed to meet societal needs and that society provides direction for scientific and technological development **(SEC1, SEC4) [ICT F2–4.8]**

- *discuss the use of seat belts in school buses*

20–B1.3sts explain that scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**

- *analyze the trajectory of lunar dust particles as illustrated in a video.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain the effects of balanced and unbalanced forces on velocity.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

20–B1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- identify questions to investigate arising from practical problems; *e.g., What are the relationships among acceleration, mass and force acting on a moving object?* **(IP–ST1)**.

Performing and Recording

Students will:

20–B1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- conduct experiments to determine relationships among force, mass and acceleration, using available technologies; *e.g., using interval timers or motion sensors to gather data* **(PR–ST3) [ICT C6–4.4]**
- research the use of kinematics and dynamics principles in everyday life; *e.g., research traffic accident investigation methods, using the Internet and/or interviews* **(PR–ST1)**.

Analyzing and Interpreting

Students will:

20–B1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze a graph of empirical data to infer the mathematical relationships among force, mass and acceleration **(AI–NS6) [ICT C6–4.1]**
- use free-body diagrams to describe the forces acting on an object **(AI–NS1)**.

Communication and Teamwork

Students will:

20–B1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical or linguistic modes of representation to communicate findings and conclusions **(CT–ST2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain that gravitational effects extend throughout the universe.

Specific Outcomes for Knowledge

Students will:

20–B2.1k identify the gravitational force as one of the fundamental forces in nature

20–B2.2k describe, qualitatively and quantitatively, Newton's law of universal gravitation

20–B2.3k explain, qualitatively, the principles pertinent to the Cavendish experiment used to determine the universal gravitational constant, G

20–B2.4k define the term "field" as a concept that replaces "action at a distance" and apply the concept to describe gravitational effects

20–B2.5k relate, qualitatively and quantitatively, using Newton's law of universal gravitation, the gravitational constant to the local value of the acceleration due to gravity

20–B2.6k predict, quantitatively, differences in the weight of objects on different planets.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–B2.1sts explain that concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**

- *compare apparent weightlessness and zero net gravity*
- *investigate the existence and shape of globular star clusters*
- *explain tidal forces on Earth*
- *describe the forces required to accelerate the Mars rover on Earth and on Mars*
- *explore the evolution of theories of gravity, using different worldviews.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain that gravitational effects extend throughout the universe.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–B2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- identify, define and delimit questions to investigate; *e.g., What is the relationship between the local value of the acceleration due to gravity and the gravitational field strength?* **(IP–NS1)**.

Performing and Recording

Students will:

20–B2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- determine, empirically, the local value of the acceleration due to gravity **(PR–NS2)**
- explore the relationship between the local value of the acceleration due to gravity and the gravitational field strength **(PR–NS1) [ICT C7–4.2]**.

Analyzing and Interpreting

Students will:

20–B2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- list the limitations of mass-weight determinations at different points on Earth's surface **(AI–NS4)**
- treat acceleration due to gravity as uniform near Earth's surface **(AI–NS3)**.

Communication and Teamwork

Students will:

20–B2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical or linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit C: Circular Motion, Work and Energy

Themes: Energy and Equilibrium

Overview: In this unit, students extend their study of kinematics and dynamics to uniform circular motion and to mechanical energy, work and power.

This unit builds on:
- Grade 8 Science, Unit D: Mechanical Systems
- Grade 9 Science, Unit E: Space Exploration
- Science 10, Unit B: Energy Flow in Technological Systems
- Physics 20, Unit A: Kinematics and Unit B: Dynamics

This unit prepares students for further study, in subsequent physics courses, of circular motion, conservation laws and particles in magnetic fields.

Unit C will require approximately 30% of the time allotted for Physics 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit C but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• properties of linear functions	Pure Mathematics 10, specific outcome 4.6; Applied Mathematics 10, specific outcomes 5.1, 5.2 and 5.7
• formula manipulation	Pure Mathematics 10, specific outcome 4.4; Applied Mathematics 10, specific outcome 5.1
• graphing inverse-square functions	Pure Mathematics 10, specific outcome 3.1; Applied Mathematics 10, specific outcome 3.1

Note: The use of systems of equations, the quadratic formula and trigonometric ratios for angles greater than 90° is not required.

Focusing Questions: What conditions are necessary to maintain circular motion? How does an understanding of conservation laws contribute to an understanding of the universe? How can mechanical energy be transferred and transformed?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explain circular motion, using Newton's laws of motion
2. explain that work is a transfer of energy and that conservation of energy in an isolated system is a fundamental physical concept.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.
- uniform circular motion
- planetary and satellite motion
- Kepler's laws
- mechanical energy
- conservation of mechanical energy
- work-energy theorem
- isolated systems
- power

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General Outcome 1
Students will explain circular motion, using Newton's laws of motion.

Specific Outcomes for Knowledge

Students will:

20–C1.1k describe uniform circular motion as a special case of two-dimensional motion

20–C1.2k explain, qualitatively and quantitatively, that the acceleration in uniform circular motion is directed toward the centre of a circle

20–C1.3k explain, quantitatively, the relationships among speed, frequency, period and radius for circular motion

20–C1.4k explain, qualitatively, uniform circular motion in terms of Newton's laws of motion

20–C1.5k explain, quantitatively, planetary and natural and artificial satellite motion, using circular motion to approximate elliptical orbits

20–C1.6k predict the mass of a celestial body from the orbital data of a satellite in uniform circular motion around the celestial body

20–C1.7k explain, qualitatively, how Kepler's laws were used in the development of Newton's law of universal gravitation.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–C1.1sts explain that the process of scientific investigation includes analyzing the evidence and providing explanations based upon scientific theories and concepts **(NS5f)**

- *examine the role of orbital perturbations in the discovery of outer planets*
- *examine the evidence for extra-solar planets*

20–C1.2sts explain how science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.8]**

- *explain the functions, applications and societal impacts of geosynchronous satellites*

20–C1.3sts explain that the goal of technology is to provide solutions to practical problems **(ST1)**

- analyze the principles and applications of circular motion in daily situations
  - *explain the use of a centrifuge in industry or research*
  - *explain the motion of a car moving with constant speed through a curve*
  - *explain the motion of carnival or playground rides moving in a horizontal plane and/or a vertical plane*
  - *explain the operation of a potter's wheel.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain circular motion, using Newton's laws of motion.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–C1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment to investigate the relationships among orbital speed, orbital radius, acceleration and force in uniform circular motion **(IP–NS2)**
- explore design characteristics of structures that facilitate circular motion; *e.g., How is banking used on a racetrack to make high-speed turns safer?* **(IP–ST1)**.

Performing and Recording

Students will:

20–C1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment to investigate the relationships among net force acting on an object in uniform circular motion and the object's frequency, mass, speed and path radius **(PR–NS3)**.

Analyzing and Interpreting

Students will:

20–C1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- organize and interpret experimental data, using prepared graphs or charts **(AI–NS1)** **[ICT C7–4.2]**
- construct graphs to show relationships among frequency, mass, speed and path radius
- summarize an analysis of the relationships among frequency, mass, speed and path radius **(AI–NS6)**
- solve, quantitatively, circular motion problems in both horizontal and vertical planes, using algebraic and/or graphical vector analysis **(AI–NS3)** **[ICT C6–4.1]**.

Communication and Teamwork

Students will:

20–C1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical or linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain that work is a transfer of energy and that conservation of energy in an isolated system is a fundamental physical concept.

Specific Outcomes for Knowledge

Students will:

20–C2.1k define mechanical energy as the sum of kinetic and potential energy

20–C2.2k determine, quantitatively, the relationships among the kinetic, gravitational potential and total mechanical energies of a mass at any point between maximum potential energy and maximum kinetic energy

20–C2.3k analyze, quantitatively, kinematics and dynamics problems that relate to the conservation of mechanical energy in an isolated system

20–C2.4k recall work as a measure of the mechanical energy transferred and power as the rate of doing work

20–C2.5k describe power qualitatively and quantitatively

20–C2.6k describe, qualitatively, the change in mechanical energy in a system that is not isolated.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–C2.1sts explain that concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**

- *estimate the energy released during a meteoritic impact with Earth's surface*
- *analyze the gravitational collapse of a star*
- *examine how a planet can provide a gravity assist to a space probe*
- *analyze the transformation of kinetic and potential energy of an orbiting object at perihelion and aphelion*

20–C2.2sts explain that the products of technology are devices, systems and processes that meet given needs; however, these products cannot solve all problems **(ST6) [ICT F3–4.1]**

- *evaluate the design and efficiency of energy transfer devices in terms of the relationships among mechanical energy, work and power*
- *analyze the use of irrigation systems and water wheels used by different cultures, such as the Incas*

20–C2.3sts evaluate whether Canadian society supports scientific research and technological development to facilitate a sustainable society, economy and environment **(SEC4a) [ICT F2–4.1]**

- *investigate and report on a technology developed to improve the efficiency of energy transfer as a means of reconciling the energy needs of society with its responsibility to protect the environment and to use energy judiciously.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain that work is a transfer of energy and that conservation of energy in an isolated system is a fundamental physical concept.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–C2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment to demonstrate the conservation of energy; *e.g., Is energy conserved in a collision?* **(IP–NS1, IP–NS2)**.

Performing and Recording

Students will:

20–C2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *perform an experiment to demonstrate the law of conservation of energy* **(PR–NS3)**
- *research the development of the law of conservation of energy, using library and Internet sources* **(PR–NS1) [ICT C1–4.1]**.

Analyzing and Interpreting

Students will:

20–C2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- use free-body diagrams to organize and communicate solutions to work-energy theorem problems **(AI–NS1)**
- solve, quantitatively, kinematics and dynamics problems, using the work-energy theorem **(AI–NS3) [ICT C6–4.1]**
- analyze data to determine effective energy conservation strategies; *e.g., analyze whether lowering the speed limit or modifying the internal combustion engine saves more energy in vehicles* **(AI–ST2, AI–SEC3) [ICT C7–4.2]**.

Communication and Teamwork

Students will:

20–C2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text* **(CT–NS2) [ICT P4–4.3]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit D: Oscillatory Motion and Mechanical Waves

Themes: Energy and Matter

Overview: In this unit, students investigate simple harmonic motion and mechanical waves.

This unit builds on:
- Science 10, Unit B: Energy Flow in Technological Systems
- Physics 20, Unit A: Kinematics; Unit B: Dynamics; and Unit C: Circular Motion, Work and Energy

This unit prepares students for further study, in subsequent physics courses, of simple harmonic motion and wave phenomena.

Unit D will require approximately 30% of the time allotted for Physics 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit D but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• graphing quadratic functions	Pure Mathematics 20, specific outcomes 2.3 and 2.4; Applied Mathematics 20, specific outcomes 2.1 and 2.3
• the properties of sinusoidal functions over a single period	Pure Mathematics 10, specific outcome 6.2; Applied Mathematics 10, specific outcome 6.2

Note: The use of systems of equations, the quadratic formula and trigonometric ratios for angles greater than 90° is not required.

Focusing Questions: What are examples of oscillatory motion in the world around us? How do mechanical waves transmit energy? How is structural design and the development of technologies influenced by our understanding of wave properties?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. describe the conditions that produce oscillatory motion
2. describe the properties of mechanical waves and explain how mechanical waves transmit energy.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- oscillatory motion
- simple harmonic motion
- restoring force
- oscillating spring, pendulum
- mechanical resonance
- mechanical waves—longitudinal and transverse
- universal wave equation
- reflection
- interference
- acoustic resonance
- Doppler effect

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General Outcome 1
Students will describe the conditions that produce oscillatory motion.

Specific Outcomes for Knowledge

Students will:

20–D1.1k describe oscillatory motion in terms of period and frequency

20–D1.2k define simple harmonic motion as a motion due to a restoring force that is directly proportional and opposite to the displacement from an equilibrium position

20–D1.3k explain, quantitatively, the relationships among displacement, acceleration, velocity and time for simple harmonic motion, as illustrated by a frictionless, horizontal mass-spring system or a pendulum, using the small-angle approximation

20–D1.4k determine, quantitatively, the relationships among kinetic, gravitational potential and total mechanical energies of a mass executing simple harmonic motion

20–D1.5k define mechanical resonance.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–D1.1sts explain that the goal of science is knowledge about the natural world **(NS1)**

- *analyze, qualitatively, the forces in real-life examples of simple harmonic motion*:
  - *action of springs in vehicle suspensions*
  - *mechanical resonance in cars, bridges and buildings*
  - *seismic waves in Earth's crust*
- *relate the fundamental frequency and amplitude of a vibrating drum membrane to its properties.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will describe the conditions that produce oscillatory motion.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–D1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment to demonstrate that simple harmonic motion can be observed within certain limits, relating the frequency and period of the motion to the physical characteristics of the system; *e.g., a frictionless horizontal mass-spring system or a pendulum* **(IP–NS2)**
- predict the conditions required for mechanical resonance **(IP–NS3)**.

Performing and Recording

Students will:

20–D1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment to determine the relationship between the length of a pendulum and its period of oscillation **(PR–NS3)**
- perform an experiment to illustrate the phenomenon of mechanical resonance **(PR–NS3)**
- perform an experiment to determine the spring constant of a spring **(PR–NS3)**.

Analyzing and Interpreting

Students will:

20–D1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- *relate the length of a pendulum to its period of oscillation* **(AI–NS2) [ICT C7–4.2]**
- *ask if the mass of the pendulum bob is a factor in the pendulum's period of oscillation* **(AI–NS5)**.

Communication and Teamwork

Students will:

20–D1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical or linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe the properties of mechanical waves and explain how mechanical waves transmit energy.

Specific Outcomes for Knowledge

Students will:

20–D2.1k describe mechanical waves as particles of a medium that are moving in simple harmonic motion

20–D2.2k compare and contrast energy transport by matter and by waves

20–D2.3k define longitudinal and transverse waves in terms of the direction of motion of the medium particles in relation to the direction of propagation of the wave

20–D2.4k define the terms wavelength, wave velocity, period, frequency, amplitude, wave front and ray as they apply to describing transverse and longitudinal waves

20–D2.5k describe how the speed of a wave depends on the characteristics of the medium

20–D2.6k predict, quantitatively, and verify the effects of changing one or a combination of variables in the universal wave equation ($v = f\lambda$)

20–D2.7k explain, qualitatively, the phenomenon of reflection as exhibited by mechanical waves

20–D2.8k explain, qualitatively, the conditions for constructive and destructive interference of waves and for acoustic resonance

20–D2.9k explain, qualitatively and quantitatively, the Doppler effect on a stationary observer of a moving source.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

20–D2.1sts explain that the goal of technology is to provide solutions to practical problems **(ST1)** **[ICT F2–4.4, F2–4.8]**

- *investigate the application of acoustic phenomena in recreation, medicine, industry and technology (sonography, ultrasound, sonar, pipe organs, wind and brass instruments, noise-reduction devices, noise-measurement devices)*
- *describe the properties of waves that can be used to manipulate direction and speed when travelling (surfing, canoeing or kayaking) in rivers or oceans.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe the properties of mechanical waves and explain how mechanical waves transmit energy.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–D2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *predict the conditions required for constructive and destructive interference to occur* **(IP–NS3)**.

Performing and Recording

Students will:

20–D2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- draw wave-front and ray diagrams **(PR–NS4)**
- draw a wave-front diagram of a two-point source interference pattern **(PR–NS4)**
- perform an experiment to illustrate the phenomenon of acoustic resonance **(PR–NS3)**.

Analyzing and Interpreting

Students will:

20–D2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- determine the speed of a mechanical wave; *e.g., water waves and sound waves* **(PR–NS2)**
- *relate apparent changes in wavelength and frequency to the speed of the source relative to the observer* **(AI–NS2) [ICT C7–4.2]**.

Communication and Teamwork

Students will:

20–D2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical or linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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PHYSICS 30

Provincial implementation of Physics 30 is September 2008.
Implementation prior to this date is **not** approved.

Physics 30 consists of four units of study:

A. Momentum and Impulse
B. Forces and Fields
C. Electromagnetic Radiation
D. Atomic Physics

Attitude Outcomes

Students will be encouraged to develop positive attitudes that support the responsible acquisition and application of knowledge related to science and technology. The following attitude outcomes are to be developed throughout Physics 30, in conjunction with the specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills in each unit.

Interest in Science

Students will be encouraged to:
show interest in science-related questions and issues and confidently pursue personal interests and career possibilities within science-related fields; *e.g.,*

- *research the answers to questions they generate*
- *explore and use a variety of methods and resources to increase their knowledge and skills*
- *be critical and constructive when considering new theories and techniques*
- *use scientific vocabulary and principles in everyday discussions*
- *recognize the usefulness of being skilled in mathematics and problem solving*
- *be interested in science and technology topics not directly related to their formal studies*
- *recognize the importance of making connections among various science disciplines*
- *maintain interest in pursuing further studies in science*
- *explore where further science- and technology-related studies and careers can be pursued*
- *recognize that many careers require science- and technology-related knowledge and skills.*

Mutual Respect

Students will be encouraged to:
appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds; *e.g.,*

- *use a multiperspective approach, considering scientific, technological, economic, cultural, political and environmental factors when formulating conclusions, solving problems or making decisions on an STS issue*
- *research carefully and discuss openly ethical dilemmas associated with the applications of science and technology*
- *explore personal perspectives, attitudes and beliefs toward scientific and technological advancements*
- *recognize the contribution of science and technology to the progress of civilizations*
- *show support for the development of technologies and science as they relate to human needs*
- *recognize that the scientific approach is one of many ways of viewing the universe*
- *recognize the research contributions of both men and women*
- *recognize the research contributions of Canadians.*

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Scientific Inquiry

Students will be encouraged to:
seek and apply evidence when evaluating alternative approaches to investigations, problems and issues; *e.g.,*

- *consider the social and cultural contexts in which a theory developed*
- *appreciate how scientific problem solving and the development of new technologies are related*
- *insist on evidence before accepting a new idea or a new explanation*
- *assess, critically, their opinion of the value of science and its applications*
- *question arguments in which evidence, explanations or positions do not reflect the diversity of perspectives that exist*
- *criticize arguments that are based on faulty, incomplete or misleading use of numbers*
- *recognize the importance of reviewing the basic assumptions from which a line of inquiry has arisen*
- *insist that the critical assumptions behind any line of reasoning be made explicit so that the validity of the position taken can be judged*
- *evaluate inferences and conclusions, being cognizant of the many variables involved in experimentation*
- *ask questions and conduct research to ensure understanding*
- *expend the effort and time needed to make valid inferences*
- *seek new models, explanations and theories when confronted with discrepant events.*

Collaboration

Students will be encouraged to:
work collaboratively in planning and carrying out investigations and in generating and evaluating ideas; *e.g.,*

- *provide the same attention and energy to the group's product as they would to a personal assignment*
- *be attentive when others speak, seek the point of view of others, and consider a multitude of perspectives*
- *use appropriate communication technology to elicit feedback from others*
- *participate in a variety of electronic group formats.*

Stewardship

Students will be encouraged to:
demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment; *e.g.,*

- *assume part of the collective responsibility for the impact of humans on the environment*
- *participate in civic activities related to the preservation and judicious use of the environment and its resources*
- *encourage their peers or members of their community to participate in a project related to sustainability*
- *consider all perspectives when addressing issues, weighing scientific, technological and ecological factors*
- *discuss both the positive and negative effects on human beings and society of environmental changes caused by nature and by humans*
- *participate in the social and political systems that influence environmental policy in their community*
- *promote actions that are not injurious to the environment*

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- *make personal decisions based on a feeling of responsibility toward less privileged parts of the global community and toward future generations*
- *be critical-minded regarding the short- and long-term consequences of sustainability.*

Safety

Students will be encouraged to:
show concern for safety in planning, carrying out and reviewing activities, referring to the Workplace Hazardous Materials Information System (WHMIS) and consumer product labelling information; *e.g.,*

- *consider safety a positive limiting factor in scientific and technological endeavours*
- *read the labels on materials before using them, interpret the WHMIS symbols and consult a reference document if safety symbols are not understood*
- *manipulate materials carefully, being cognizant of the risks and consequences of their actions*
- *assume responsibility for the safety of all those who share a common working environment by cleaning up after an activity and disposing of materials according to safety guidelines*
- *seek assistance immediately for any first-aid concerns, such as cuts, burns or unusual reactions*
- *keep the work station uncluttered, ensuring that only appropriate laboratory materials are present*
- *criticize a procedure, a design or materials that are not safe or that could have a negative impact on the environment*
- *use safety and waste disposal as criteria for evaluating an experiment*
- *write safety and waste-disposal precautions into a laboratory procedure.*

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Unit A: Momentum and Impulse

Themes: Change and Systems

Overview: In this unit, Newton's second law of motion is linked to the concepts of momentum and impulse.

This unit builds on:

- Physics 20, Unit A: Kinematics; Unit B: Dynamics; and Unit C: Circular Motion, Work and Energy

This unit prepares students for further study of mechanics in subsequent units and for post-secondary studies in physics. Unit A will require approximately 15% of the time allotted for Physics 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit A but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• properties of linear functions	Pure Mathematics 10, specific outcome 4.6; Applied Mathematics 10, specific outcomes 5.1, 5.2 and 5.7
• graphing quadratic functions	Pure Mathematics 20, specific outcomes 2.3 and 2.4; Applied Mathematics 20, specific outcomes 2.1 and 2.3
• vector components and vector addition	Pure Mathematics 10, specific outcomes 6.1 and 6.3; Applied Mathematics 30, specific outcomes 5.1 to 5.4

Note: The use of systems of equations, the quadratic formula and trigonometric ratios for angles greater than 90° is not required.

Focusing Questions: What characteristics of an object affect its momentum? How are momentum and impulse related? How does our understanding of concepts relating momentum and impulse influence the design of safety and sporting equipment?

General Outcomes: There is one major outcome in this unit.

Students will:

1. explain how momentum is conserved when objects interact in an isolated system.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the learning outcomes.

- impulse
- momentum
- Newton's laws of motion
- elastic collisions
- inelastic collisions

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General Outcome 1
Students will explain how momentum is conserved when objects interact in an isolated system.

Specific Outcomes for Knowledge

Students will:

30–A1.1k define momentum as a vector quantity equal to the product of the mass and the velocity of an object

30–A1.2k explain, quantitatively, the concepts of impulse and change in momentum, using Newton's laws of motion

30–A1.3k explain, qualitatively, that momentum is conserved in an isolated system

30–A1.4k explain, quantitatively, that momentum is conserved in one- and two-dimensional interactions in an isolated system

30–A1.5k define, compare and contrast elastic and inelastic collisions, using quantitative examples, in terms of conservation of kinetic energy.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

30–A1.1sts explain that technological problems often require multiple solutions that involve different designs, materials and processes and that have both intended and unintended consequences **(ST3) [ICT F3–4.1]**

- *investigate the role of impulse and momentum in the design and function of rockets and thrust systems*
- *assess the roles that conservation laws, the concepts of impulse and inertia and Newton's laws play in the design and use of injury-prevention devices in vehicles and sports*
- *describe the limitations of applying the results from studies of isolated systems in solving a practical problem, as occurred with the early design and deployment of airbags.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain how momentum is conserved when objects interact in an isolated system.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

30–A1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment and identify and control major variables; *e.g., demonstrate the conservation of linear momentum or illustrate the relationship between impulse and change in momentum* **(IP–NS2)**.

Performing and Recording

Students will:

30–A1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment to demonstrate the conservation of linear momentum, using available technologies; *e.g., air track, air table, motion sensors, strobe lights and photography* **(PR–NS2, PR–NS3) [ICT C6–4.4]**
- collect information from various print and electronic sources to explain the use of momentum and impulse concepts; *e.g., rocketry and thrust systems or the interaction between a golf club head and the ball* **(PR–ST1, PR–ST2) [ICT C1–4.1]**.

Analyzing and Interpreting

Students will:

30–A1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze graphs that illustrate the relationship between force and time during a collision **(AI–NS2) [ICT C7–4.2]**
- analyze, quantitatively, one- and two-dimensional interactions, using given data or by manipulating objects or computer simulations **(AI–NS3) [ICT C6–4.2, C7–4.2]**.

Communication and Teamwork

Students will:

30–A1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate International System of Units (SI) notation, fundamental and derived units and significant digits **(CT–NS2)★**
- use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate ideas, plans and results **(CT–ST2)★**
- use the delta notation correctly when describing changes in quantities **(CT–NS2)★**.

★To be developed throughout the course.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit B: Forces and Fields

Themes: Energy and Matter

Overview: In this unit, students investigate electric and magnetic forces and fields and their applications in technological devices.

This unit builds on:
- Science 9, Unit D: Electrical Principles and Technologies
- Physics 20, Unit A: Kinematics; Unit B: Dynamics; Unit C: Circular Motion, Work and Energy; and Unit D: Oscillatory Motion and Mechanical Waves

This unit prepares students for further study of electromagnetic phenomena in subsequent units and for post-secondary studies in physics. Unit B will require approximately 30% of the time allotted for Physics 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit B but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• properties of linear functions	Pure Mathematics 10, specific outcome 4.6; Applied Mathematics 10, specific outcomes 5.1, 5.2 and 5.7
• graphing quadratic functions	Pure Mathematics 20, specific outcomes 2.3 and 2.4; Applied Mathematics 20, specific outcomes 2.1 and 2.3
• vector components and vector addition	Pure Mathematics 10, specific outcomes 6.1 and 6.2 ; Applied Mathematics 30, specific outcomes 5.1 to 5.4
• formula manipulation	Pure Mathematics 10, specific outcome 4.4; Applied Mathematics 10, specific outcome 5.1
• solving nonlinear equations	Pure Mathematics 20, specific outcome 3.1; Applied Mathematics 20, specific outcome 2.1

Note: The use of systems of equations, the quadratic formula and trigonometric ratios for angles greater than 90° is not required.

Focusing Questions: How was the value of the elementary charge determined? What is the relationship between electricity and magnetism? How does magnetism assist in the understanding of fundamental particles? How has this understanding revolutionized the modern way of life?

General Outcomes: There are three major outcomes in this unit.

Students will:

1. explain the behaviour of electric charges, using the laws that govern electrical interactions
2. describe electrical phenomena, using the electric field theory
3. explain how the properties of electric and magnetic fields are applied in numerous devices.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the learning outcomes.

- electric charge
- conservation of charge
- Coulomb's law
- vector fields
- electric field
- magnetic field
- electric potential difference
- interaction of charges with electric and magnetic fields
- charge quantization—Millikan's experiment
- electromagnetic induction

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General Outcome 1
Students will explain the behaviour of electric charges, using the laws that govern electrical interactions.

Specific Outcomes for Knowledge

Students will:

30–B1.1k explain electrical interactions in terms of the law of conservation of charge

30–B1.2k explain electrical interactions in terms of the repulsion and attraction of charges

30–B1.3k compare the methods of transferring charge (conduction and induction)

30–B1.4k explain, qualitatively, the distribution of charge on the surfaces of conductors and insulators

30–B1.5k explain, qualitatively, the principles pertinent to Coulomb's torsion balance experiment

30–B1.6k apply Coulomb's law, quantitatively, to analyze the interaction of two point charges

30–B1.7k determine, quantitatively, the magnitude and direction of the electric force on a point charge due to two or more other point charges in a plane

30–B1.8k compare, qualitatively and quantitatively, the inverse square relationship as it is expressed by Coulomb's law and by Newton's universal law of gravitation.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–B1.1sts explain that concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**

- *explain that the electric model of matter is fundamental to the interpretation of electrical phenomena*
- *explain that charge separation and transfer from one object to another are fundamental electrical processes*

30–B1.2sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4]**

- *compare and contrast the experimental designs used by Coulomb and Cavendish, in terms of the role that technology plays in advancing science.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain the behaviour of electric charges, using the laws that govern electrical interactions.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–B1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design an experiment to examine the relationships among magnitude of charge, electric force and distance between point charges* **(IP–NS2)**
- *predict the results of an activity that demonstrates charge separation and transfer* **(IP–NS3) [ICT C6–4.1]**.

Performing and Recording

Students will:

30–B1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an activity to demonstrate methods of charge separation and transfer **(PR–NS3)**
- perform an experiment to demonstrate the relationships among magnitude of charge, electric force and distance between point charges **(PR–NS2, PR–NS3) [ICT C6–4.4]**.

Analyzing and Interpreting

Students will:

30–B1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- infer, from empirical evidence, the mathematical relationship among charge, force and distance between point charges **(AI–NS2) [ICT C7–4.2]**
- use free-body diagrams to describe the electrostatic forces acting on a charge **(AI–NS1)**
- use graphical techniques to analyze data; *e.g., curve straightening (manipulating variables to obtain a straight-line graph)* **(AI–NS2) [ICT C6–4.3, C7–4.2]**.

Communication and Teamwork

Students will:

30–B1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe electrical phenomena, using the electric field theory.

Specific Outcomes for Knowledge

Students will:

30–B2.1k define vector fields
30–B2.2k compare forces and fields
30–B2.3k compare, qualitatively, gravitational potential energy and electric potential energy
30–B2.4k define electric potential difference as a change in electric potential energy per unit of charge
30–B2.5k calculate the electric potential difference between two points in a uniform electric field
30–B2.6k explain, quantitatively, electric fields in terms of intensity (strength) and direction, relative to the source of the field and to the effect on an electric charge
30–B2.7k define electric current as the amount of charge passing a reference point per unit of time
30–B2.8k describe, quantitatively, the motion of an electric charge in a uniform electric field
30–B2.9k explain, quantitatively, electrical interactions using the law of conservation of energy
30–B2.10k explain Millikan's oil-drop experiment and its significance relative to charge quantization.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

30–B2.1sts explain that the goal of technology is to provide solutions to practical problems **(ST1) [ICT F2–4.4]**

- *assess how the principles of electrostatics are used to solve problems in industry and technology and to improve upon quality of life; e.g., photocopiers, electrostatic air cleaners, precipitators, antistatic clothing products, lightning rods*

30–B2.2sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4]**

- *explain, qualitatively, how the problem of protecting sensitive components in a computer from electric fields is solved.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe electrical phenomena, using the electric field theory model.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

30–B2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *evaluate and select appropriate procedures and instruments for collecting data and information and for determining and plotting electric fields* **(IP–ST3) [ICT C6–4.5]**.

Performing and Recording

Students will:

30–B2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- plot electric fields, using field lines, for fields induced by discrete point charges, combinations of discrete point charges (similarly and oppositely charged) and charged parallel plates **(PR–NS2)**.

Analyzing and Interpreting

Students will:

30–B2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze, quantitatively, the motion of an electric charge following a straight or curved path in a uniform electric field, using Newton's second law, vector addition and conservation of energy **(AI–NS3)**
- use accepted scientific convention and express energy in terms of electron volts, when appropriate **(AI–NS1)**
- use free-body diagrams to describe the forces acting on a charge in an electric field **(AI–NS1).**

Communication and Teamwork

Students will:

30–B2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–ST2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain how the properties of electric and magnetic fields are applied in numerous devices.

Specific Outcomes for Knowledge

Students will:

30–B3.1k describe magnetic interactions in terms of forces and fields

30–B3.2k compare gravitational, electric and magnetic fields (caused by permanent magnets and moving charges) in terms of their sources and directions

30–B3.3k describe how the discoveries of Oersted and Faraday form the foundation of the theory relating electricity to magnetism

30–B3.4k describe, qualitatively, a moving charge as the source of a magnetic field and predict the orientation of the magnetic field from the direction of motion

30–B3.5k explain, qualitatively and quantitatively, how a uniform magnetic field affects a moving electric charge, using the relationships among charge, motion, field direction and strength, when motion and field directions are mutually perpendicular

30–B3.6k explain, quantitatively, how uniform magnetic and electric fields affect a moving electric charge, using the relationships among charge, motion, field direction and strength, when motion and field directions are mutually perpendicular

30–B3.7k describe and explain, qualitatively, the interaction between a magnetic field and a moving charge and between a magnetic field and a current-carrying conductor

30–B3.8k explain, quantitatively, the effect of an external magnetic field on a current-carrying conductor

30–B3.9k describe, qualitatively, the effects of moving a conductor in an external magnetic field, in terms of moving charges in a magnetic field.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–B3.1sts explain that concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**

- *discuss, qualitatively, Lenz's law in terms of conservation of energy, giving examples of situations in which Lenz's law applies*
- *investigate the mechanism that causes atmospheric auroras*

30–B3.2sts explain that the goal of technology is to provide solutions to practical problems and that the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST1, ST7) [ICT F2–4.2, F3–4.1]**

- *evaluate an electromagnetic technology, such as magnetic resonance imaging (MRI), positron emission tomography (PET), transformers, alternating current (AC) and direct current (DC) motors, AC and DC generators, speakers, telephones*
- *investigate the effects of electricity and magnetism on living organisms, in terms of the limitations of scientific knowledge and technology and in terms of quality of life*

30–B3.3sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4]**

- *describe how technological developments were influenced by the discovery of superconductivity*
- *investigate how nanotubes can be used to construct low-resistance conductors.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will explain how the properties of electric and magnetic fields are applied in numerous devices.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–B3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment to demonstrate the effect of a uniform magnetic field on a current-carrying conductor **(IP–NS2)**
- design an experiment to demonstrate the effect of a uniform magnetic field on a moving conductor **(IP–NS2)**
- *design an experiment to demonstrate the effect of a uniform magnetic field on a moving electric charge* **(IP–NS2)**.

Performing and Recording

Students will:

30–B3.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment to demonstrate the effect of a uniform magnetic field on a current-carrying conductor, using the appropriate apparatus effectively and safely **(PR–NS2, PR–NS3) [ICT F5–4.2]**
- perform an experiment to demonstrate the effect of a uniform magnetic field on a moving conductor, using the appropriate apparatus effectively and safely **(PR–NS2, PR–NS3) [ICT F5–4.2]**
- predict, using appropriate hand rules, the relative directions of motion, force and field in electromagnetic interactions **(PR–NS2)**.

Analyzing and Interpreting

Students will:

30–B3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- state a conclusion, based on experimental evidence that describes the interactions of a uniform magnetic field and a moving or current-carrying conductor **(AI–NS6)**
- analyze, quantitatively, the motion of an electric charge following a straight or curved path in a uniform magnetic field, using Newton's second law and vector addition **(AI–NS3) [ICT C7–4.2]**
- analyze, quantitatively, the motion of an electric charge following a straight path in uniform and mutually perpendicular electric and magnetic fields, using Newton's second law and vector addition **(AI–NS3) [ICT C7–4.2]**
- use free-body diagrams to describe forces acting on an electric charge in electric and magnetic fields **(AI–NS1)**.

Communication and Teamwork

Students will:

30–B3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit C: Electromagnetic Radiation

Themes: Diversity and Matter

Overview: In this unit, students study the nature and characteristics of electromagnetic radiation (EMR), using the wave and photon models of light.

This unit builds on:

- Science 8, Unit C: Light and Optical Systems
- Physics 20, Unit C: Circular Motion, Work and Energy
- Physics 30, Unit A: Momentum and Impulse and Unit B: Forces and Fields

This unit prepares students for further study of EMR phenomena and the nature of matter in Unit D and for post-secondary studies in physics. Unit C will require approximately 30% of the time allotted for Physics 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit C but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• formula manipulation	Pure Mathematics 10, specific outcome 4.4; Applied Mathematics 10, specific outcome 5.1
• solving nonlinear equations	Pure Mathematics 20, specific outcome 3.1; Applied Mathematics 20, specific outcome 2.1

Note: Systems of equations and solutions to quadratic equations are not required.

Focusing Questions: What roles do electricity and magnetism play in EMR? Does EMR have a wave or a particle nature? What experimental evidence is required to decide whether EMR has a wave or a particle nature? What technological devices are used today as a result of investigating and applying electromagnetic phenomena?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explain the nature and behaviour of EMR, using the wave model
2. explain the photoelectric effect, using the quantum model.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the learning outcomes.

- speed of EMR
- propagation of EMR
- reflection
- refraction
- diffraction
- interference
- total internal reflection
- Snell's law
- photoelectric effect
- Compton effect

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General Outcome 1
Students will explain the nature and behaviour of EMR, using the wave model.

Specific Outcomes for Knowledge

Students will:

30–C1.1k describe, qualitatively, how all accelerating charges produce EMR

30–C1.2k compare and contrast the constituents of the electromagnetic spectrum on the basis of frequency and wavelength

30–C1.3k explain the propagation of EMR in terms of perpendicular electric and magnetic fields that are varying with time and travelling away from their source at the speed of light

30–C1.4k explain, qualitatively, various methods of measuring the speed of EMR

30–C1.5k calculate the speed of EMR, given data from a Michelson-type experiment

30–C1.6k describe, quantitatively, the phenomena of reflection and refraction, including total internal reflection

30–C1.7k describe, quantitatively, simple optical systems, consisting of only one component, for both lenses and curved mirrors

30–C1.8k describe, qualitatively, diffraction, interference and polarization

30–C1.9k describe, qualitatively, how the results of Young's double-slit experiment support the wave model of light

30–C1.10k solve double-slit and diffraction grating problems using, $\lambda = \frac{xd}{nl}$, $\lambda = \frac{d \sin \theta}{n}$

30–C1.11k describe, qualitatively and quantitatively, how refraction supports the wave model of EMR, using $\frac{\sin \theta_1}{\sin \theta_2} = \frac{n_2}{n_1} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$

30–C1.12k compare and contrast the visible spectra produced by diffraction gratings and triangular prisms.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–C1.1sts explain that scientific knowledge is subject to change as new evidence becomes apparent and as laws and theories are tested and subsequently revised, reinforced or rejected **(NS4)**

- *use examples, such as Poisson's spot, speed of light in water, sunglasses, photography and liquid crystal diodes, to illustrate how theories evolve*

30–C1.2sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4]**

- *describe procedures for measuring the speed of EMR*
- *investigate the design of greenhouses, cameras, telescopes, solar collectors and fibre optics*
- *investigate the effects of frequency and wavelength on the growth of plants*
- *investigate the use of interferometry techniques in the search for extrasolar planets.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain the nature and behaviour of EMR, using the wave model.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–C1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues
- predict the conditions required for diffraction to be observed **(IP–NS3)**
- predict the conditions required for total internal reflection to occur **(IP–NS3)**
- design an experiment to measure the speed of light **(IP–NS2)**.

Performing and Recording

Students will:

30–C1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information
- perform experiments to demonstrate refraction at plane and uniformly curved surfaces **(PR–NS2)**
- perform an experiment to determine the index of refraction of several different substances **(PR–NS2, PR–NS3, PR–NS4)**
- conduct an investigation to determine the focal length of a thin lens and of a curved mirror **(PR–NS2, PR–NS3, PR–NS4)**
- observe the visible spectra formed by diffraction gratings and triangular prisms **(PR–NS2)**
- perform an experiment to determine the wavelength of a light source in air or in a liquid, using a double-slit or a diffraction grating **(PR–NS2, PR–NS3)**
- perform an experiment to verify the effects on an interference pattern due to changes in wavelength, slit separation and/or screen distance **(PR–NS2, PR–NS3) [ICT C7–4.2]**.

Analyzing and Interpreting

Students will:

30–C1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions
- derive the mathematical representation of the law of refraction from experimental data **(AI–NS2) [ICT C7–4.2]**
- use ray diagrams to describe an image formed by thin lenses and curved mirrors **(AI–NS1)**
- demonstrate the relationship among wavelength, slit separation and screen distance, using empirical data and algorithms **(AI–NS6)**
- determine the wavelength of EMR, using data provided from demonstrations and other sources; *e.g., wavelengths of microwaves from the interference patterns of television signals or microwave ovens* **(AI–NS3, AI–NS4)**.

Communication and Teamwork

Students will:

30–C1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results
- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions; *e.g., draw ray diagrams* **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the photoelectric effect, using the quantum model.

Specific Outcomes for Knowledge

Students will:

30–C2.1k define the photon as a quantum of EMR and calculate its energy

30–C2.2k classify the regions of the electromagnetic spectrum by photon energy

30–C2.3k describe the photoelectric effect in terms of the intensity and wavelength or frequency of the incident light and surface material

30–C2.4k describe, quantitatively, photoelectric emission, using concepts related to the conservation of energy

30–C2.5k describe the photoelectric effect as a phenomenon that supports the notion of the wave-particle duality of EMR

30–C2.6k explain, qualitatively and quantitatively, the Compton effect as another example of wave-particle duality, applying the laws of mechanics and of conservation of momentum and energy to photons.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–C2.1sts explain that scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**

- *describe how Hertz discovered the photoelectric effect while investigating electromagnetic waves*
- *describe how Planck used energy quantization to explain blackbody radiation*

30–C2.2sts explain that concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**

- *investigate and report on the development of early quantum theory*
- *identify similarities between physicists' efforts at unifying theories and holistic Aboriginal worldviews*

30–C2.3sts explain that the goal of technology is to provide solutions to practical problems **(ST1)** **[ICT F2–4.4]**

- *analyze, in general terms, the functioning of various technological applications of photons to solve practical problems; e.g., automatic door openers, burglar alarms, light meters, smoke detectors, X-ray examination of welds, crystal structure analysis.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain the photoelectric effect, using the quantum model.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–C2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- predict the effect, on photoelectric emissions, of changing the intensity and/or frequency of the incident radiation or material of the photocathode **(IP–NS3)**
- *design an experiment to measure Planck's constant, using either a photovoltaic cell or a light-emitting diode (LED)* **(IP–NS2, IP–NS4)**.

Performing and Recording

Students will:

30–C2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *perform an experiment to demonstrate the photoelectric effect* **(PR–NS3) [ICT C6–4.4]**
- *measure Planck's constant, using either a photovoltaic cell or an LED* **(PR–NS2, PR–NS3)**.

Analyzing and Interpreting

Students will:

30–C2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze and interpret empirical data from an experiment on the photoelectric effect, using a graph that is either drawn by hand or is computer generated **(AI–NS2, AI–NS4) [ICT C6–4.2, C6–4.3]**.

Communication and Teamwork

Students will:

30–C2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit D: Atomic Physics

Themes: Energy and Matter

Overview: In this unit, students study the development and modification of models of the structure of matter.

This unit builds on:
- Science 9, Unit E: Space Exploration
- Physics 20, Unit C: Circular Motion, Work and Energy
- Physics 30, Unit A: Momentum and Impulse, Unit B: Forces and Fields and Unit C: Electromagnetic Radiation

This unit prepares students for further study of the nature of matter in post-secondary studies in physics. Unit D will require approximately 25% of the time allotted for Physics 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit D but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• formula manipulation	Pure Mathematics 10, specific outcome 4.4; Applied Mathematics 10, specific outcome 5.1
• solving nonlinear equations	Pure Mathematics 20, specific outcome 3.1; Applied Mathematics 20, specific outcome 2.1
• properties of the exponential function	Pure Mathematics 20, specific outcome 6.4; Pure Mathematics 30, specific outcomes 2.4 and 2.5; Applied Mathematics 20, specific outcomes 2.3 to 2.5

Note: The use of systems of equations, the quadratic formula and logarithms is not required.

Focusing Questions: How is the atom organized? How can a model of the atom and the nucleus be subjected to experimental tests? How does knowledge of the internal structure of the atom lead to the development of applications of energy supply and to the technology of diagnostic imaging?

General Outcomes: There are four major outcomes in this unit.

Students will:

1. describe the electrical nature of the atom
2. describe the quantization of energy in atoms and nuclei
3. describe nuclear fission and fusion as powerful energy sources in nature
4. describe the ongoing development of models of the structure of matter.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the learning outcomes.
- charge-to-mass ratio (Thomson's experiment)
- classical model of the atom (Rutherford, Bohr)
- spectra: continuous, line emission and line absorption
- energy levels (states)
- de Broglie hypothesis
- quantum mechanical model
- half-life
- nuclear decay
- nuclear reactions
- Standard Model of matter

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General Outcome 1
Students will describe the electrical nature of the atom.

Specific Outcomes for Knowledge

Students will:

30–D1.1k describe matter as containing discrete positive and negative charges

30–D1.2k explain how the discovery of cathode rays contributed to the development of atomic models

30–D1.3k explain J. J. Thomson's experiment and the significance of the results for both science and technology

30–D1.4k explain, qualitatively, the significance of the results of Rutherford's scattering experiment, in terms of scientists' understanding of the relative size and mass of the nucleus and the atom.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–D1.1sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4]**

- *analyze how the identification of the electron and its characteristics is an example of the interaction of science and technology*
- *analyze the operation of cathode-ray tubes and mass spectrometers.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will describe the electrical nature of the atom.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–D1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- identify, define and delimit questions to investigate; *e.g., "What is the importance of cathode rays in the development of atomic models?"* **(IP–NS1)**
- evaluate and select appropriate procedures and instruments for collecting evidence and information, including appropriate sampling procedures; *e.g., use electric and magnetic fields to determine the charge-to-mass ratio of the electron* **(IP–NS4) [ICT C6–4.5, F1–4.2]**.

Performing and Recording

Students will:

30–D1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment, or use simulations, to determine the charge-to-mass ratio of the electron **(PR–NS2, PR–NS3) [ICT C6–4.4, F1–4.2]**.

Analyzing and Interpreting

Students will:

30–D1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- determine the mass of an electron and/or ion, given appropriate empirical data **(AI–NS3)**
- derive a formula for the charge-to-mass ratio that has input variables that can be measured in an experiment using electric and magnetic fields **(AI–NS6)**.

Communication and Teamwork

Students will:

30–D1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe the quantization of energy in atoms and nuclei.

Specific Outcomes for Knowledge

Students will:

30–D2.1k explain, qualitatively, how emission of EMR by an accelerating charged particle invalidates the classical model of the atom

30–D2.2k describe that each element has a unique line spectrum

30–D2.3k explain, qualitatively, the characteristics of, and the conditions necessary to produce, continuous line-emission and line-absorption spectra

30–D2.4k explain, qualitatively, the concept of stationary states and how they explain the observed spectra of atoms and molecules

30–D2.5k calculate the energy difference between states, using the law of conservation of energy and the observed characteristics of an emitted photon

30–D2.6k explain, qualitatively, how electron diffraction provides experimental support for the de Broglie hypothesis

30–D2.7k describe, qualitatively, how the two-slit electron interference experiment shows that quantum systems, like photons and electrons, may be modelled as particles or waves, contrary to intuition.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–D2.1sts explain that scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**

- *investigate and report on the use of line spectra in the study of the universe and the identification of substances*
- *investigate how empirical evidence guided the evolution of the atomic model*

30–D2.2sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4]**

- *investigate and report on the application of spectral or quantum concepts in the design and function of practical devices, such as street lights, advertising signs, electron microscopes and lasers.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe the quantization of energy in atoms and nuclei.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–D2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- predict the conditions necessary to produce line-emission and line-absorption spectra **(IP–NS3)**
- predict the possible energy transitions in the hydrogen atom, using a labelled diagram showing energy levels **(IP–NS3)**.

Performing and Recording

Students will:

30–D2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- observe line-emission and line-absorption spectra **(PR–NS2)**
- observe the representative line spectra of selected elements **(PR–NS2)**
- use library and electronic research tools to compare and contrast, qualitatively, the classical and quantum models of the atom **(PR–NS1) [ICT C1–4.1, C7–4.2]**.

Analyzing and Interpreting

Students will:

30–D2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- identify elements represented in sample line spectra by comparing them to representative line spectra of elements **(AI–NS6) [ICT C7–4.2]**.

Communication and Teamwork

Students will:

30–D2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will describe nuclear fission and fusion as powerful energy sources in nature.

Specific Outcomes for Knowledge

Students will:

30–D3.1k describe the nature and properties, including the biological effects, of alpha, beta and gamma radiation

30–D3.2k write nuclear equations, using isotope notation, for alpha, beta-negative and beta-positive decays, including the appropriate neutrino and antineutrino

30–D3.3k perform simple, nonlogarithmic half-life calculations

30–D3.4k use the law of conservation of charge and mass number to predict the particles emitted by a nucleus

30–D3.5k compare and contrast the characteristics of fission and fusion reactions

30–D3.6k relate, qualitatively and quantitatively, the mass defect of the nucleus to the energy released in nuclear reactions, using Einstein's concept of mass-energy equivalence.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–D3.1sts explain that the goal of science is knowledge about the natural world **(NS1)**

- *investigate the role of nuclear reactions in the evolution of the universe (nucleosynthesis, stellar expansion and contraction)*
- *investigate annihilation of particles and pair production*

30–D3.2sts explain that the products of technology are devices, systems and processes that meet given needs and that the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST6, ST7) [ICT F2–4.2, F3–4.1]**

- *assess the risks and benefits of air travel (exposure to cosmic radiation), dental X-rays, radioisotopes used as tracers, food irradiation, use of fission or fusion as a commercial power source and nuclear and particle research*
- *assess the potential of fission or fusion as a commercial power source to meet the rising demand for energy, with consideration for present and future generations.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will describe nuclear fission and fusion as powerful energy sources in nature.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–D3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- predict the penetrating characteristics of decay products **(IP–NS3)**.

Performing and Recording

Students will:

30–D3.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *research and report on scientists who contributed to the understanding of the structure of the nucleus* **(PR–NS1)**.

Analyzing and Interpreting

Students will:

30–D3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- graph data from radioactive decay and estimate half-life values **(AI–NS2) [ICT C6–4.3]**
- interpret common nuclear decay chains **(AI–NS6)**
- graph data from radioactive decay and infer an exponential relationship between measured radioactivity and elapsed time **(AI–NS2) [ICT C6–4.3]**
- compare the energy released in a nuclear reaction to the energy released in a chemical reaction, on the basis of energy per unit mass of reactants **(AI–NS3)**.

Communication and Teamwork

Students will:

30–D3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 4
Students will describe the ongoing development of models of the structure of matter.

Specific Outcomes for Knowledge

Students will:

30–D4.1k explain how the analysis of particle tracks contributed to the discovery and identification of the characteristics of subatomic particles

30–D4.2k explain, qualitatively, in terms of the strong nuclear force, why high-energy particle accelerators are required to study subatomic particles

30–D4.3k describe the modern model of the proton and neutron as being composed of quarks

30–D4.4k compare and contrast the up quark, the down quark, the electron and the electron neutrino, and their antiparticles, in terms of charge and energy (mass-energy)

30–D4.5k describe beta-positive (β^+) and beta-negative (β^-) decay, using first-generation elementary fermions and the principle of charge conservation (Feynman diagrams are not required).

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

30–D4.1sts explain that concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**

- *research and report on the development of models of matter*

30–D4.2sts explain that scientific knowledge is subject to change as new evidence becomes apparent and as laws and theories are tested and subsequently revised, reinforced or rejected **(NS4)**

- *observe how apparent conservation law violations led to revisions of the model of the atom; i.e., an apparent failure of conservation laws required the existence of the neutrino*

30–D4.3sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4]**

- *investigate how high-energy particle accelerators contributed to the development of the Standard Model of matter.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 4
Students will describe the ongoing development of models of the structure of matter.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–D4.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- predict the characteristics of elementary particles, from images of their tracks in a bubble chamber, within an external magnetic field **(IP–NS3)**.

Performing and Recording

Students will:

30–D4.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *research, using library and electronic resources, the relationships between the fundamental particles and the interactions they undergo* **(PR–NS1) [ICT C1–4.1]**.

Analyzing and Interpreting

Students will:

30–D4.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze, qualitatively, particle tracks for subatomic particles other than protons, electrons and neutrons **(AI–NS2) [ICT C7–4.2]**
- write β^+ and β^- decay equations, identifying the elementary fermions involved **(PR–NS4)**
- use hand rules to determine the nature of the charge on a particle **(AI–NS6)**
- use accepted scientific convention and express mass in terms of mega electron volts per c^2 (MeV/c^2), when appropriate **(AI–NS1)**.

Communication and Teamwork

Students will:

30–D4.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Effective September 2007, pages 11 to 36 have been **removed** and **replaced** with the **new provincially implemented** Physics 20 (2007) Program of Studies.

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SCIENCE 20–30

PROGRAM RATIONALE AND PHILOSOPHY

Science programs provide opportunities for students to develop the knowledge, skills and attitudes they need to become productive and responsible members of society. The programs also allow students to explore interests and prepare for further education and careers. Students graduating from Alberta schools require the scientific and related technological knowledge and skills that will enable them to understand and interpret their world. They also need to develop attitudes that will motivate them to use their knowledge and skills in a responsible manner.

To become scientifically literate, students need to develop a knowledge of science and its relationship to technologies and society. They also need to develop the broad-based skills required to identify and analyze problems; to explore and test solutions; and to seek, interpret and evaluate information. To ensure relevance to students as well as to societal needs, a science program must present science in a meaningful context—providing opportunities for students to explore the process of science, its applications and implications, and to examine related technological problems and issues. By doing so, students become aware of the role of science in responding to social and cultural change and in meeting needs for a sustainable environment, economy and society.

Program Vision

The secondary science program is guided by the vision that all students, regardless of gender or cultural background, are given the opportunity to develop scientific literacy. The goal of scientific literacy is to develop in students the science-related knowledge, skills and attitudes that they need to solve problems and make decisions and, at the same time, to help students become lifelong learners who maintain their sense of wonder about the world around them.

Diverse learning experiences within the science program provide students with opportunities to explore, analyze and appreciate the interrelationships among science, technology, society and the environment and to develop understandings that will affect their personal lives, their careers and their futures.

Goals

The following goals for Canadian science education, developed in the *Common Framework of Science Learning Outcomes K to 12: Pan-Canadian Protocol for Collaboration on School Curriculum* (1997), are addressed through the Alberta science program. Science education will:

- encourage students at all grade levels to develop a critical sense of wonder and curiosity about scientific and technological endeavours

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- enable students to use science and technology to acquire new knowledge and solve problems so that they may improve the quality of their lives and the lives of others
- prepare students to critically address science-related societal, economic, ethical and environmental issues
- provide students with a foundation in science that creates opportunities for them to pursue progressively higher levels of study, prepares them for science-related occupations and engages them in science-related hobbies appropriate to their interests and abilities
- develop in students of varying aptitudes and interests a knowledge of the wide spectrum of careers related to science, technology and the environment.

Aboriginal Perspectives

Courses in the senior high school sciences incorporate Aboriginal perspectives in order to develop, in all students, an appreciation of the cultural diversity and achievements of First Nations, Métis and Inuit (FNMI) peoples. These courses are designed to:

- acknowledge the contributions of Aboriginal peoples to understandings of the natural world
- support relational thinking by integrating learning from various disciplines of science
- develop the concept of humankind's connectivity to the natural world and foster an appreciation for the importance of caring for the environment
- foster the development of positive attitudes by providing experiences that encourage all students to feel confident about their ability to succeed in science.

Information and Communication Technology (ICT)

Selected curriculum outcomes from Alberta Education's Information and Communication Technology (ICT) Program of Studies are infused throughout the 20-level and 30-level sciences so that students will develop a broad perspective on the nature of technology, learn how to use and apply a variety of technologies, and consider the impact of ICT on individuals and society. The infusion of ICT outcomes supports and reinforces the understandings and abilities that students are expected to develop within Foundation 3 (Science, Technology and Society) and Foundation 4 (Skills) of these courses. Effective, efficient and ethical application of ICT outcomes contributes to the program vision.

Infusion of ICT outcomes provides learning opportunities for students to:

- understand the nature of technology and apply terminology appropriately
- use equipment carefully and share limited ICT resources
- use technology in an ethical manner, including respecting the ownership of information and digital resources and citing electronic sources
- use technology safely, including applying ergonomic principles and appropriate safety procedures
- use the Internet safely, including protecting personal information and avoiding contact with strangers
- use technology appropriately, including following communication etiquette and respecting the privacy of others.

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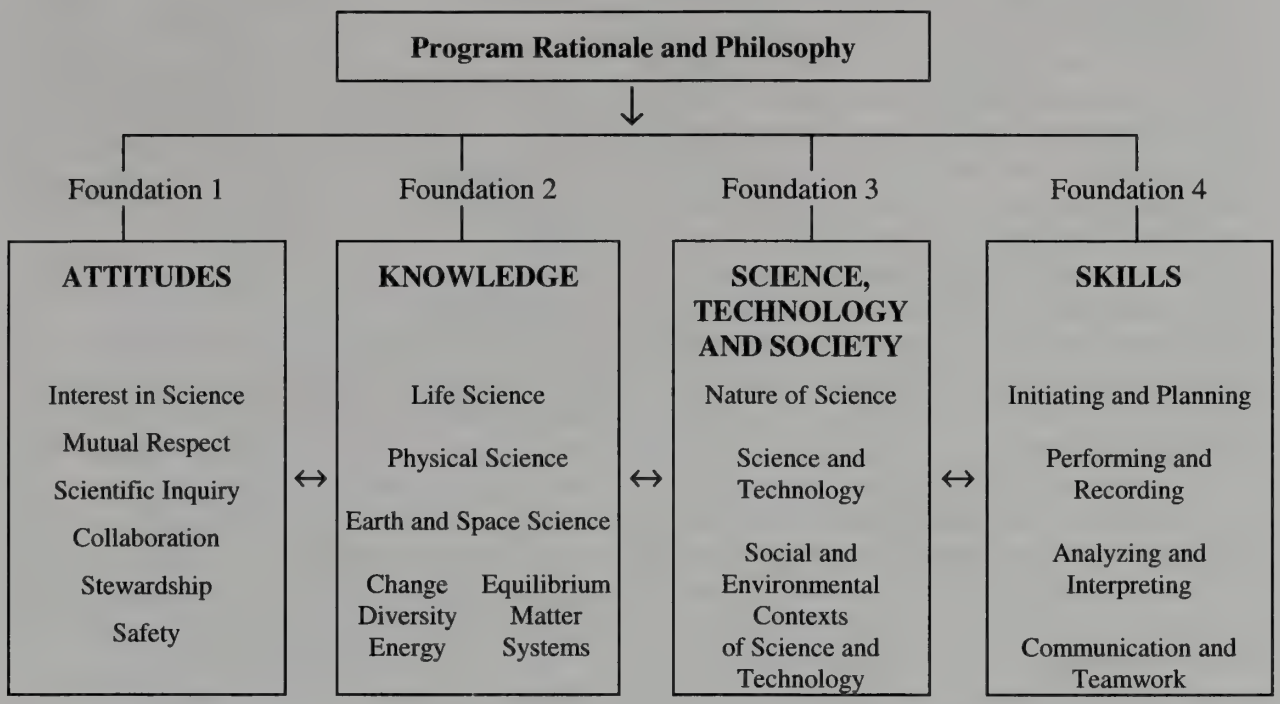
PROGRAM FOUNDATIONS

To support the development of scientific literacy, a science program must provide learning experiences that address critical aspects of science and its application. These foundations provide a general direction for the program and identify the major components of its structure.



Foundation 1
Attitudes—*Students will be encouraged to* develop attitudes that support the responsible acquisition and application of scientific and technological knowledge to the mutual benefit of self, society and the environment.

Foundation 2
Knowledge—*Students will* construct knowledge and understandings of concepts in life science, physical science and Earth and space science, and apply these understandings to interpret, integrate and extend their knowledge.

Foundation 3
Science, Technology and Society (STS)—*Students will* develop an understanding of the nature of science and technology, the relationships between science and technology, and the social and environmental contexts of science and technology.

Foundation 4
Skills—*Students will* develop the skills required for scientific and technological inquiry, for solving problems, for communicating scientific ideas and results, for working collaboratively and for making informed decisions.

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Foundation 1: Attitudes

Foundation 1 is concerned with the generalized aspects of behaviour that are commonly referred to as attitudes. Attitude outcomes are of a different form than outcomes for skills and knowledge: they are exhibited in a different way, and they are rooted more deeply in the experiences that students bring to school. Attitude development is a lifelong process that involves the home, the school, the community and society at large. Attitudes are best shown not by the events of a particular moment but by the pattern of behaviours over time. Development of positive attitudes plays an important role in student growth by interacting with students' intellectual development and by creating a readiness for responsible application of what is learned.

Interest in Science

Students will be encouraged to develop enthusiasm and continuing interest in the study of science.

Mutual Respect

Students will be encouraged to appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds.

Scientific Inquiry

Students will be encouraged to develop attitudes that support active inquiry, problem solving and decision making.

Collaboration

Students will be encouraged to develop attitudes that support collaborative activity.

Stewardship

Students will be encouraged to develop responsibility in the application of science and technology in relation to society and the natural environment.

Safety

Students will be encouraged to demonstrate a concern for safety in science and technology contexts.

Foundation 2: Knowledge

Foundation 2 focuses on the subject matter of science, including the laws, theories, models, concepts and principles that are essential to an understanding of each science area. For organizational purposes, this foundation is framed using widely accepted science disciplines.

Life Science

Life science deals with the growth and interactions of life forms within their environments in ways that reflect their uniqueness, diversity, genetic continuity and changing nature. Life science includes such fields of study as ecosystems, biological diversity, organisms, cells, biochemistry, genetic engineering and biotechnology.

Physical Science

Physical science, which encompasses chemistry and physics, deals with matter, energy and forces. Matter has structure, and there are interactions among its components. Energy links matter to gravitational, electromagnetic and nuclear forces in the universe. Physical science also addresses the conservation laws of mass and energy, momentum and charge.

Earth and Space Science

Earth and space science brings global and universal perspectives to student knowledge. The planet Earth exhibits form, structure and patterns of change, as does the surrounding solar system and the physical universe beyond it. Earth and space science includes such fields of study as geology, meteorology and astronomy.

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Themes are the major ideas of science and technology that transcend discipline boundaries and demonstrate unity among the natural sciences. Six themes have been identified for the senior high school sciences program.

Change
Students will develop an understanding of:

How all natural entities are modified over time, how the direction of change might be predicted and, in some instances, how change can be controlled.

Diversity
Students will develop an understanding of:

The array of living and nonliving forms of matter and the procedures used to understand, classify and distinguish these forms of matter on the basis of recurring patterns.

Energy
Students will develop an understanding of:

The capacity for doing work that drives much of what takes place in the universe through its variety of interconvertible forms.

Equilibrium
Students will develop an understanding of:

The state in which opposing forces or processes balance in a static or dynamic way.

Matter
Students will develop an understanding of:

The constituent parts, and the variety of states, of the material in the physical world.

Systems
Students will develop an understanding of:

The interrelated groups of things or events that can be defined by their boundaries and, in some instances, by their inputs and outputs.

Foundation 3: Science, Technology and Society (STS)

Foundation 3 is concerned with understanding the scope and character of science, its connections to technology and the social context in which it is developed. The following is a brief introduction to the major ideas underlying this component of the program.

Nature of Science

Science provides an ordered way of learning about the nature of things, based on observation and evidence. Through science, we explore our environment, gather knowledge and develop ideas that help us interpret and explain what we see. Scientific activity provides a conceptual and theoretical base that is used in predicting, interpreting and explaining natural and technological phenomena. Science is driven by a combination of specific knowledge, theory, observation and experimentation. Science-based ideas are continually being tested, modified and improved as new knowledge and explanations supersede existing knowledge and explanations.

Science and Technology

Technology is concerned with solving practical problems that arise from human needs. Historically, the development of technology has been strongly linked to the development of science, with each making contributions to the other. While there are important relationships and interdependencies, there are also important differences. Whereas the focus of science is on the development and verification of knowledge, the focus of technology is on the development of solutions, involving devices and systems that meet a given need within the constraints of a problem. The test of scientific knowledge is that it helps us explain, interpret and predict; the test of technology is that it works—it enables us to achieve a given purpose.

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Social and Environmental Contexts

The history of science shows that scientific development takes place within a social context. Many examples can be used to show that cultural and intellectual traditions have influenced the focus and methodologies of science, and that science in turn has influenced the wider world of ideas.

Today, research is often driven by societal and environmental needs and issues. As technological solutions have emerged from previous research, many of the new technologies have given rise to complex social and environmental issues. Increasingly, these issues are becoming part of the political agenda. The potential of science to inform and empower decision making by individuals, communities and society is central to scientific literacy in a democratic society.

Foundation 4: Skills

Foundation 4 is concerned with the skills that students develop in answering questions, solving problems and making decisions. While these skills are not unique to science, they play an important role in the development of scientific understandings and in the application of science and technology to new situations. Four broad skill areas are outlined in the secondary science program. Each skill area is developed at each level with increasing scope and complexity of application.

Initiating and Planning

These are the skills of questioning, identifying problems and developing preliminary ideas and plans.

Performing and Recording

These are the skills of carrying out a plan of action that include gathering evidence by observation and, in most cases, manipulating materials and equipment.

Analyzing and Interpreting

These are the skills of examining information and evidence; of processing and presenting data so that they can be interpreted; and of interpreting, evaluating and applying the results.

Communication and Teamwork

In science, as in other areas, communication skills are essential at every stage during which ideas are being developed, tested, interpreted, debated and agreed upon. Teamwork skills are also important, as the development and application of science ideas are collaborative processes both in society and in the classroom.

PROGRAM ORGANIZATION

Attitude Outcomes

A listing of Attitude outcomes is included at the beginning of each of the 20-level and 30-level courses in the senior high school sciences program. These specific outcomes are to be developed throughout the particular course in conjunction with the specific outcomes for Knowledge, STS and Skills listed within each unit of study.

Units of Study

In the senior high school sciences program, four units of study are outlined for each course. Each unit in the 20-level and 30-level courses includes the following components.

Themes

Themes are the major ideas of science that transcend topics of study.

Overview

The overview introduces the contents of the unit and suggests an approach to unit development.

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Links to Mathematics

This section lists topics from mathematics programs of study that are related to the science content of the unit.

Focusing Questions

These questions frame a context for introducing the unit and suggest a focus for investigative activities and application of ideas by students.

Key Concepts

Key concepts identify major ideas to be developed in the unit. Some of the concepts may be addressed in additional units of the same course, as well as in other courses. The intended scope of treatment of these concepts is indicated by the outcomes.

Outcomes

Two levels of outcomes are provided in each unit:

- General Outcomes: These are the major outcomes in the unit that students are to demonstrate over the course of their learning.
- Specific Outcomes: These are detailed outcomes that delineate the scope of each general outcome and the unit. Specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills are identified.

The outcomes are numbered for the purpose of referencing. This numbering is not intended to imply a fixed instructional sequence.

Examples

Many of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

STS Emphases

The specific outcomes for Science, Technology and Society (STS) and Skills for each general outcome in a unit include one of the following emphases:

- Nature of Science
- Science and Technology
- Social and Environmental Contexts

The STS emphases provide opportunities for students to develop related concepts and skills as outlined on pages 8 to 10.

Additional Links

Links to the STS emphasis frameworks (pages 8 to 10) are shown in **boldface** and (in parentheses) after specific outcomes for STS and after specific outcomes or examples for Skills. Links to the Division 4 ICT curriculum (pages 11 to 13) are shown in **boldface** and [in brackets] after some of the specific outcomes and examples for STS and Skills. The STS and ICT links indicate that the concept or skill from the STS emphasis framework or the Division 4 ICT outcome has been addressed in the specific outcome or example.

Note: The listing of STS and ICT links is not exhaustive; other links may exist.

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Framework for Developing a Nature of Science Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on how scientific knowledge is developed)

Students will develop an understanding that:

- the goal of science is knowledge about the natural world **(NS1)**
- scientific knowledge and theories develop through hypotheses, the collection of evidence, investigation and the ability to provide explanations **(NS2)**
- scientific knowledge results from peer review and replication of the research of others **(NS3)**
- scientific knowledge is subject to change as new evidence becomes apparent and as laws and theories are tested and subsequently revised, reinforced or rejected **(NS4)**
- the process of scientific investigation includes **(NS5)**:
  - identifying the theoretical basis of the investigation **(NS5a)**
  - defining and delimiting, clearly, research questions or ideas to be tested **(NS5b)**
  - designing the investigation **(NS5c)**
  - evaluating and selecting means to collect and record evidence **(NS5d)**
  - carrying out the investigation **(NS5e)**
  - analyzing the evidence and providing explanations based upon scientific theories and concepts **(NS5f)**
- scientific paradigms are conceptual inventions that help organize, interpret and explain findings **(NS6)**
  - Concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**
  - Conventions of mathematics, nomenclature and notation provide a basis for organizing and communicating scientific theory, relationships and concepts; e.g., chemical symbols **(NS6b)**
  - Scientific language is precise, and specific terms may be used in each field of study **(NS6c)**
- scientific inquiry is limited to certain questions **(NS7)**

Skills (focus on scientific inquiry)

Initiating and Planning **(IP–NS)**

Students will:

- identify, define and delimit questions to investigate **(IP–NS1)**
- design an experiment, identifying and controlling major variables **(IP–NS2)**
- state a prediction and a hypothesis based on available evidence or background information or on a theory **(IP–NS3)**
- evaluate and select appropriate procedures, including appropriate sampling procedures, and instruments for collecting evidence and information **(IP–NS4)**

Performing and Recording **(PR–NS)**

Students will:

- research, integrate and synthesize information from various print and electronic sources regarding a scientific question **(PR–NS1)**
- select and use appropriate instruments for collecting data effectively, safely and accurately **(PR–NS2)**
- carry out procedures, controlling the major variables, and adapt or extend procedures where required **(PR–NS3)**
- compile and organize findings and data by hand or computer, using appropriate formats such as diagrams, flowcharts, tables and graphs **(PR–NS4)**
- apply Workplace Hazardous Materials Information System (WHMIS) standards to handle and dispose of materials **(PR–NS5)**

Analyzing and Interpreting **(AI–NS)**

Students will:

- apply appropriate terminology, classification systems and nomenclature used in the sciences **(AI–NS1)**
- interpret patterns and trends in data and predict the value of a variable by interpolating or extrapolating from graphical data or from a line of best fit **(AI–NS2)**
- estimate and calculate the value of variables, compare theoretical and empirical values, and account for discrepancies **(AI–NS3)**
- identify limitations of data or measurements; explain sources of error; and evaluate the relevance, reliability and adequacy of data and data collection methods **(AI–NS4)**
- identify new questions or problems that arise from what was learned **(AI–NS5)**
- state a conclusion, based on data obtained from investigations, and explain how evidence gathered supports or refutes a hypothesis, prediction or theory **(AI–NS6)**

Communication and Teamwork **(CT–NS)**

Students will:

- work collaboratively to develop and carry out investigations **(CT–NS1)**
- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–NS2)**
- evaluate individual and group processes used in planning and carrying out investigative tasks **(CT–NS3)**

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Framework for Developing a Science and Technology Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on the interrelationship of science and technology)

Students will develop an understanding that:

- the goal of technology is to provide solutions to practical problems **(ST1)**
- technological development may involve the creation of prototypes, the testing of prototypes and the application of knowledge from related scientific and interdisciplinary fields **(ST2)**
- technological problems often require multiple solutions that involve different designs, materials and processes and that have both intended and unintended consequences **(ST3)**
- scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4)**
- the process for technological development includes **(ST5)**:
  - defining and delimiting, clearly, the problems to be solved and establishing criteria to assess the technological solution **(ST5a)**
  - identifying the constraints, the benefits and the drawbacks **(ST5b)**
  - developing designs and prototypes **(ST5c)**
  - testing and evaluating designs and prototypes on the basis of established criteria **(ST5d)**
- the products of technology are devices, systems and processes that meet given needs; however, these products cannot solve all problems **(ST6)**
- the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7)**

Skills (focus on problem solving)

Initiating and Planning **(IP–ST)**

Students will:

- identify questions to investigate arising from practical problems **(IP–ST1)**
- propose and assess alternative solutions to a given practical problem, select one and develop a plan **(IP–ST2)**
- evaluate and select appropriate procedures and instruments for collecting data and information and for solving problems **(IP–ST3)**

Performing and Recording **(PR–ST)**

Students will:

- research, integrate and synthesize information from various print and electronic sources relevant to a practical problem **(PR–ST1)**
- construct and test a prototype device or system and troubleshoot problems as they arise **(PR–ST2)**
- select and use tools, apparatus and materials safely **(PR–ST3)**

Analyzing and Interpreting **(AI–ST)**

Students will:

- evaluate designs and prototypes on the basis of self-developed criteria; e.g., function, reliability, cost, safety, efficient use of materials, impact on the environment **(AI–ST1)**
- analyze alternative solutions to a given problem, identify potential strengths and weaknesses of each and recommend an approach to solving the problem, based on findings **(AI–ST2)**
- solve problems by selecting appropriate technology to perform manipulations and calculations **(AI–ST3)**
- identify new questions and problems that arise from what was learned and evaluate potential applications of findings **(AI–ST4)**

Communication and Teamwork **(CT–ST)**

Students will:

- work collaboratively to test a prototype device or system and troubleshoot problems as they arise **(CT–ST1)**
- select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate findings and conclusions **(CT–ST2)**
- evaluate individual and group processes used in planning and carrying out problem-solving tasks **(CT–ST3)**

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Framework for Developing a Social and Environmental Contexts Emphasis (Grades 10–12)

The following concepts and skills are developed through this STS emphasis.

Concepts (focus on issues related to the application of science and technology)

Students will develop an understanding that:

- science and technology are developed to meet societal needs and expand human capability **(SEC1)**
- science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2)**
- science and technology have both intended and unintended consequences for humans and the environment **(SEC3)**
- society provides direction for scientific and technological development **(SEC4)**
  - Canadian society supports scientific research and technological development to facilitate a sustainable society, economy and environment **(SEC4a)**
  - Decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b)**
  - Society supports scientific and technological development by recognizing accomplishments, publishing and disseminating results and providing financial support **(SEC4c)**
- scientific and technological activity may arise from, and give rise to, such personal and social values as accuracy, honesty, perseverance, tolerance, open-mindedness, critical-mindedness, creativity and curiosity **(SEC5)**
- science and technology provide opportunities for a diversity of careers based on post-secondary studies, for the pursuit of hobbies and interests, and for lifelong learning **(SEC6)**

Skills (focus on applying science to inform decision-making processes)

Initiating and Planning **(IP–SEC)**
Students will:

- identify questions to investigate that arise from issues related to the application of science and technology **(IP–SEC1)**
- plan complex searches for information, using a wide variety of electronic and print sources **(IP–SEC2)**
- assess and develop appropriate processes for collecting relevant data and information about science-and-technology-related issues **(IP–SEC3)**

Performing and Recording **(PR–SEC)**
Students will:

- research, integrate and synthesize information from various print and electronic sources relevant to a given question, problem or issue **(PR–SEC1)**
- select information and gather evidence from appropriate sources and evaluate search strategies **(PR–SEC2)**

Analyzing and Interpreting **(AI–SEC)**
Students will:

- apply given criteria for evaluating evidence and assess the authority, reliability, scientific accuracy and validity of sources of information **(AI–SEC1)**
- apply a variety of perspectives in assessing the risks and benefits of scientific and technological developments **(AI–SEC2)**
- assess potential decisions and recommend the best one, based on findings **(AI–SEC3)**
- identify new questions that arise and evaluate, from a variety of perspectives, potential implications of findings **(AI–SEC4)**

Communication and Teamwork **(CT–SEC)**
Students will:

- work collaboratively to investigate a science-and-technology-related issue **(CT–SEC1)**
- communicate in a persuasive and an engaging manner, using appropriate multimedia forms, to further understand a complex science-and-technology-related issue **(CT–SEC2)**
- make clear and logical arguments to defend a given decision on an issue, based on findings **(CT–SEC3)**
- evaluate individual and group processes used in investigating an issue and in evaluating alternative decisions **(CT–SEC4)**

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Division 4 ICT Outcomes

Category: Communicating, Inquiring, Decision Making and Problem Solving

General Outcomes	Specific Outcomes
C1 **Students will access, use and communicate information from a variety of technologies.**	C1 4.1 plan and perform complex searches, using more than one electronic source 4.2 select information from appropriate sources, including primary and secondary sources 4.3 evaluate and explain the advantages and disadvantages of various search strategies 4.4 communicate in a persuasive and engaging manner, through appropriate forms, such as speeches, letters, reports and multimedia presentations, applying information technologies for context, audience and purpose that extend and communicate understanding of complex issues
C2 **Students will seek alternative viewpoints, using information technologies.**	C2 4.1 consult a wide variety of sources that reflect varied viewpoints on particular topics 4.2 evaluate the validity of gathered viewpoints against other sources
C3 **Students will critically assess information accessed through the use of a variety of technologies.**	C3 4.1 assess the authority, reliability and validity of electronically accessed information 4.2 demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic
C4 **Students will use organizational processes and tools to manage inquiry.**	C4 4.1 use calendars, time management or project management software to assist in conducting an inquiry
C5 **Students will use technology to aid collaboration during inquiry.**	C5 4.1 use telecommunications to pose critical questions to experts 4.2 participate in a variety of electronic group formats
C6 **Students will use technology to investigate and/or solve problems.**	C6 4.1 investigate and solve problems of prediction, calculation and inference 4.2 investigate and solve problems of organization and manipulation of information 4.3 manipulate data by using charting and graphing technologies in order to test inferences and probabilities 4.4 generate new understandings of problematic situations by using some form of technology to facilitate the process 4.5 evaluate the appropriateness of the technology used to investigate or solve a problem
C7 **Students will use electronic research techniques to construct personal knowledge and meaning.**	C7 4.1 use appropriate strategies to locate information to meet personal needs 4.2 analyze and synthesize information to determine patterns and links among ideas 4.3 use appropriate presentation software to demonstrate personal understandings

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Division 4 ICT Outcomes (continued)

Category: Foundational Operations, Knowledge and Concepts

General Outcomes	Specific Outcomes
F1 **Students will demonstrate an understanding of the nature of technology.**	**F1** 4.1 assess the strengths and weaknesses of computer simulations in relation to real-world problems 4.2 solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments 4.3 apply terminology appropriate to technology in all forms of communication 4.4 demonstrate an understanding of the general concepts of computer programming and the algorithms that enable technological devices to perform operations and solve problems
F2 **Students will understand the role of technology as it applies to self, work and society.**	**F2** 4.1 use technology outside formal classroom settings 4.2 analyze how technological innovations and creativity affect the economy 4.3 demonstrate an understanding of new and emerging communication systems 4.4 evaluate possible potential for emerging technologies 4.5 demonstrate conservation measures when using technology 4.6 demonstrate an understanding of the basic principles and issues of e-commerce, including such topics as security and privacy, marketing, and implications for governments, businesses and consumers alike 4.7 use current, reliable information sources from around the world 4.8 analyze and assess the impact of technology on the global community
F3 **Students will demonstrate a moral and ethical approach to the use of technology.**	**F3** 4.1 demonstrate an understanding of how changes in technology can benefit or harm society 4.2 record relevant data for acknowledging sources of information, and cite sources correctly 4.3 respect ownership and integrity of information
F4 **Students will become discerning consumers of mass media and electronic information.**	**F4** 4.1 discriminate between style and content in a presentation 4.2 evaluate the influence and results of digital manipulation on our perceptions 4.3 identify and analyze a variety of factors that affect the authenticity of information derived from mass media and electronic communication
F5 **Students will practise the concepts of ergonomics and safety when using technology.**	**F5** 4.1 assess new physical environments with respect to ergonomics 4.2 identify safety regulations specific to the technology being used
F6 **Students will demonstrate a basic understanding of the operating skills required in a variety of technologies.**	**F6** 4.1 continue to demonstrate the outcomes addressed within the previous divisions. Students interested in pursuing advanced study in such areas as electronics, programming, computer-aided design and drafting (CADD), robotics and other industrial applications of technology will find opportunities in Career and Technology Studies (CTS) courses

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Division 4 ICT Outcomes (continued)

Category: Processes for Productivity

General Outcomes	Specific Outcomes
P1 **Students will compose, revise and edit text.**	P1 4.1 continue to demonstrate the outcomes achieved in prior grades and course subjects
P2 **Students will organize and manipulate data.**	P2 4.1 manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets
P3 **Students will communicate through multimedia.**	P3 4.1 select and use, independently, multimedia capabilities for presentations in various subject areas 4.2 support communication with appropriate images, sounds and music 4.3 apply general principles of graphic layout and design to a document in process
P4 **Students will integrate various applications.**	P4 4.1 integrate a variety of visual and audio information into a document to create a message targeted for a specific audience 4.2 apply principles of graphic design to enhance meaning and audience appeal 4.3 use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text
P5 **Students will navigate and create hyperlinked resources.**	P5 4.1 create multiple-link documents appropriate to the content of a particular topic 4.2 post multiple-link pages on the World Wide Web or on a local or wide area network
P6 **Students will use communication technology to interact with others.**	P6 4.1 select and use the appropriate technologies to communicate effectively with a targeted audience

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SCIENCE 20

Science 20 consists of four units of study:

A. Chemical Changes
B. Changes in Motion
C. The Changing Earth
D. Changes in Living Systems

Attitude Outcomes

Students will be encouraged to develop positive attitudes that support the responsible acquisition and application of knowledge related to science and technology. The following attitude outcomes are to be developed throughout Science 20, in conjunction with the specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills in each unit.

Interest in Science

Students will be encouraged to:
show interest in science-related questions and issues and confidently pursue personal interests and career possibilities within science-related fields; *e.g.,*

- *research the answers to questions they generate*
- *explore and use a variety of methods and resources to increase their knowledge and skills*
- *be critical and constructive when considering new theories and techniques*
- *use scientific vocabulary and principles in everyday discussions*
- *recognize the usefulness of being skilled in mathematics and problem solving*
- *be interested in science and technology topics not directly related to their formal studies*
- *recognize the importance of making connections among various science disciplines*
- *maintain interest in pursuing further studies in science*
- *explore where further science- and technology-related studies and careers can be pursued*
- *recognize that many careers require science- and technology-related knowledge and skills.*

Mutual Respect

Students will be encouraged to:
appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds; *e.g.,*

- *use a multiperspective approach, considering scientific, technological, economic, cultural, political and environmental factors when formulating conclusions, solving problems or making decisions on an STS issue*
- *research carefully and discuss openly ethical dilemmas associated with the applications of science and technology*
- *explore personal perspectives, attitudes and beliefs toward scientific and technological advancements*
- *recognize the contribution of science and technology to the progress of civilizations*
- *show support for the development of technologies and science as they relate to human needs*
- *recognize that Western approaches to science are not the only ways of viewing the universe*
- *recognize the research contributions of both men and women*
- *recognize the research contributions of Canadians.*

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Scientific Inquiry

Students will be encouraged to:
seek and apply evidence when evaluating alternative approaches to investigations, problems and issues; *e.g.,*

- *consider the social and cultural contexts in which a theory developed*
- *appreciate how scientific problem solving and the development of new technologies are related*
- *insist on evidence before accepting a new idea or a new explanation*
- *assess, critically, their opinion of the value of science and its applications*
- *question arguments in which evidence, explanations or positions do not reflect the diversity of perspectives that exist*
- *criticize arguments that are based on faulty, incomplete or misleading use of numbers*
- *recognize the importance of reviewing the basic assumptions from which a line of inquiry has arisen*
- *insist that the critical assumptions behind any line of reasoning be made explicit so that the validity of the position taken can be judged*
- *evaluate inferences and conclusions, being cognizant of the many variables involved in experimentation*
- *ask questions and conduct research to ensure understanding*
- *expend the effort and time needed to make valid inferences*
- *seek new models, explanations and theories when confronted with discrepant events.*

Collaboration

Students will be encouraged to:
work collaboratively in planning and carrying out investigations and in generating and evaluating ideas; *e.g.,*

- *provide the same attention and energy to the group's product as they would to a personal assignment*
- *be attentive when others speak, seek the point of view of others, and consider a multitude of perspectives*
- *use appropriate communication technology to elicit feedback from others*
- *participate in a variety of electronic group formats.*

Stewardship

Students will be encouraged to:
demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment; *e.g.,*

- *assume part of the collective responsibility for the impact of humans on the environment*
- *participate in civic activities related to the preservation and judicious use of the environment and its resources*
- *encourage their peers or members of their community to participate in a project related to sustainability*
- *consider all perspectives when addressing issues, weighing scientific, technological and ecological factors*
- *discuss both the positive and negative effects on human beings and society of environmental changes caused by nature and by humans*
- *participate in the social and political systems that influence environmental policy in their community*
- *promote actions that are not injurious to the environment*

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- *make personal decisions based on a feeling of responsibility toward less privileged parts of the global community and toward future generations*
- *be critical-minded regarding the short- and long-term consequences of sustainability.*

Safety

Students will be encouraged to:
show concern for safety in planning, carrying out and reviewing activities, referring to the Workplace Hazardous Materials Information System (WHMIS) and consumer product labelling information; *e.g.,*

- *consider safety a positive limiting factor in scientific and technological endeavours*
- *read the labels on materials before using them, interpret the WHMIS symbols and consult a reference document if safety symbols are not understood*
- *manipulate materials carefully, being cognizant of the risks and consequences of their actions*
- *assume responsibility for the safety of all those who share a common working environment by cleaning up after an activity and disposing of materials according to safety guidelines*
- *seek assistance immediately for any first-aid concerns, such as cuts, burns or unusual reactions*
- *keep the work station uncluttered, ensuring that only appropriate laboratory materials are present*
- *criticize a procedure, a design or materials that are not safe or that could have a negative impact on the environment*
- *use safety and waste disposal as criteria for evaluating an experiment*
- *write safety and waste-disposal precautions into a laboratory procedure.*

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Unit A: Chemical Changes

Themes: Matter, Change and Energy

Overview: Chemical changes involve a change in energy. In order for students to understand how numerous useful materials are produced, they need to develop an understanding of concentrations of aqueous solutions, oxidation-reduction (redox) processes and the characteristics of hydrocarbons. Economically important industries in Alberta and other parts of Canada are based upon the application of chemical principles.

This unit builds on:
- Science 10, Unit A: Energy and Matter in Chemical Change

This unit provides a background for:
- Science 30, Unit B: Chemistry and the Environment

Unit A will require approximately 25% of the time allotted for Science 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit A but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• linear equations	Applied Mathematics 10, specific outcome 5.1
• measurement	Applied Mathematics 10, specific outcomes 1.2 and 1.3; Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: What is concentration? How has knowledge about oxidation-reduction in aqueous solutions been applied to solve practical problems? What characteristics of hydrocarbons are important to industry in Alberta?

General Outcomes: There are three major outcomes in this unit.

Students will:

1. investigate aqueous solutions to determine conductivity and to calculate concentration
2. explain oxidation, reduction and spontaneity and apply this knowledge to voltaic and electrolytic cells and to industrial processes
3. describe the properties of simple hydrocarbons and describe hydrocarbon-based industrial processes that are important in Alberta.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- electrolytes
- nonelectrolytes
- concentration
- dilution
- oxidation/anode
- reduction/cathode
- spontaneity
- applications of oxidation-reduction reactions
- voltaic cell
- electrolytic cell
- naming and drawing structural formulas for saturated/unsaturated hydrocarbons (containing up to eight carbon atoms in the parent chain)
- hydrocarbon reactions important to industry in Alberta

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General Outcome 1
Students will investigate aqueous solutions to determine conductivity and to calculate concentration.

Specific Outcomes for Knowledge

Students will:

20–A1.1k explain how dissolving substances in water is often a prerequisite for chemical reactions and chemical changes; *e.g., batteries, baking, medications*

20–A1.2k differentiate, on the basis of properties, between electrolytes and nonelectrolytes

20–A1.3k compare and explain how concentrations of solutions are expressed in moles per litre, percent by volume and parts per million

20–A1.4k determine the concentration of solutions in moles per litre, percent by volume and parts per million

20–A1.5k determine the concentration of diluted solutions and the quantities of a concentrated solution and of water to use when diluting.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

20–A1.1sts explain how science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.8]**

- *identify properties of aqueous solutions that enable chemical reactions important for industry*

20–A1.2sts explain that science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2) [ICT F2–4.8]**

- *compare the ways in which concentrations are expressed in chemistry laboratories, industrial processes, household products and environmental studies.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will investigate aqueous solutions to determine conductivity and to calculate concentration.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

20–A1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design a procedure to identify a solution as an electrolyte or a nonelectrolyte **(IP–NS2) [ICT F1–4.2]**.

Performing and Recording

Students will:

20–A1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- use a conductivity apparatus to identify a solution as an electrolyte or a nonelectrolyte **(PR–NS2)**
- use a pipette and volumetric glassware to prepare a solution **(PR–NS2, PR–NS5)**.

Analyzing and Interpreting

Students will:

20–A1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- use experimental data to determine the concentration of a solution **(AI–NS3) [ICT C6–4.1]**
- evaluate the risk involved in the handling, storage and disposal of solutions that are in common use in the laboratory, in the home and in industry across Alberta **(AI–SEC2, PR–NS5)**.

Communication and Teamwork

Students will:

20–A1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate International System of Units (SI) notation, fundamental and derived units and significant digits **(CT–ST2)**★
- *compare personal data on electrolytes and nonelectrolytes with the data of other students* **(CT–NS3)**
- *research, in teams, the impact of the release of effluent into waterways* **(IP–SEC3, PR–SEC1, AI–SEC3, CT–SEC1) [ICT C1–4.1]**.

★To be developed throughout the course.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain oxidation, reduction and spontaneity and apply this knowledge to voltaic and electrolytic cells and to industrial processes.

Specific Outcomes for Knowledge

Students will:

20–A2.1k balance provided single-replacement reaction equations, building on knowledge from Science 10, Unit A

20–A2.2k determine the reactivity of metals by comparing their reaction in various aqueous solutions

20–A2.3k relate single-replacement reactions to oxidation-reduction and apply mole ratios from given equations to predict moles of metals consumed or produced

20–A2.4k define, operationally, oxidation and reduction and spontaneous and nonspontaneous reactions; i.e., loss of electrons is oxidation, gain of electrons is reduction, a spontaneous oxidation-reduction reaction produces electrical energy from chemical change, and a nonspontaneous oxidation-reduction reaction requires electrical energy to produce chemical change

20–A2.5k apply the principles of oxidation-reduction and half-reactions to describe, in general terms, the operation of voltaic and electrolytic cells; *e.g., batteries, metal extraction, cathodic protection, galvanizing, electroplating*
Note: Students are not expected to construct oxidation-reduction reaction equations; i.e., combining two half-reactions to produce a net equation.

20–A2.6k compare modern and traditional methods for the extraction of metals and for protection from corrosion; *e.g., development of glazes in traditional Aboriginal pottery manufacturing.*

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

20–A2.1sts illustrate how science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2) [ICT F2–4.8, F3–4.1]**
- *analyze the importance of voltaic, electrolytic and fuel cells and predict their future importance in society and industry*

20–A2.2sts describe applications of science and technology that have developed in response to human and environmental needs **(SEC1)**
- *investigate the use of technology to solve practical problems related to oxidation-reduction, considering cathodic protection, galvanizing, electroplating and extraction of metals*

20–A2.3sts illustrate how technological problems often require multiple solutions that involve different designs, materials and processes and that have both intended and unintended consequences **(ST3) [ICT C6–4.5, F3–4.1]**
- *describe the need for industrial processes to make use of efficient designs to provide optimal yields within constraints of cost and requirements for sustainability (production of smaller and longer-lasting batteries, for example, and considerations for their disposal)*
- *analyze technological products and processes related to batteries, metal extraction and anti-corrosion in terms of scientific principles and environmental stewardship.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will explain oxidation, reduction and spontaneity and apply this knowledge to voltaic and electrolytic cells and to industrial processes.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

20–A2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- describe procedures for safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–ST3, PR–NS5)**
- design a voltaic cell, with the aid of an activity series chart, to illustrate a spontaneous oxidation-reduction reaction **(IP–NS2, IP–NS3)**.

Performing and Recording

Students will:

20–A2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform metals-in-aqueous-solutions experiments to observe the spontaneity of a series of oxidation-reduction reactions **(IP–ST3, PR–ST3) [ICT C6–4.1, C6–4.2]**
- create a chart or table that presents the results of oxidation-reduction experiments **(PR–NS4) [ICT C6–4.3]**
- construct a voltaic cell to illustrate a spontaneous oxidation-reduction reaction **(PR–ST2, PR–ST3)**.

Analyzing and Interpreting

Students will:

20–A2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- determine the relative strengths of the oxidizing and reducing agents for a series of oxidation-reduction reactions **(AI–ST3) [ICT C6–4.1]**
- draw and label sketches of operating voltaic and electrolytic cells, identifying the anode, the cathode, oxidation, reduction and electron flow **(PR–NS4, CT–NS2)**.

Communication and Teamwork

Students will:

20–A2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *analyze, constructively, the designs for operating voltaic and electrolytic cells developed by others* **(CT–NS3) [ICT C6–4.5]**
- *participate in a variety of electronic group formats to investigate an electrically powered device (battery-powered vehicles, watches or the effect of different batteries on the operation of listening devices, for example)* **(CT–SEC2) [ICT C3–4.1, C5–4.2]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will describe the properties of simple hydrocarbons and describe hydrocarbon-based industrial processes that are important in Alberta.

Specific Outcomes for Knowledge

Students will:

20–A3.1k identify materials used in daily life that are based upon Alberta's petrochemical industry and that involve changes in energy; *e.g., plastics, cosmetics, gasoline*

20–A3.2k identify the physical characteristics of hydrocarbons, including trends with respect to melting and boiling points and solubility of alkanes, alkenes and alkynes

20–A3.3k provide International Union of Pure and Applied Chemistry (IUPAC) names and structural formulas for simple and noncyclic hydrocarbons in the homologous series of alkanes, alkenes and alkynes that contain up to eight carbon atoms in the parent chain

20–A3.4k identify hydrocarbons as a source of fossil fuels and explain the processes of fractional distillation to refine petroleum and catalytic cracking to produce ethene (ethylene)

20–A3.5k classify, balance and apply mole ratios to important hydrocarbon reactions:
- combustion of hydrocarbons to produce carbon dioxide, water vapour and energy
- production of ethene (ethylene) from catalytic cracking
- hydrogenation of alkenes (unsaturated) to produce alkanes (saturated)
- polymerization of ethene (ethylene) to polyethene (polyethylene).

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

20–A3.1sts develop an understanding that science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.8]**
- *describe some major reactions of the petrochemical industry in Alberta, such as the production of methanol and polyethene*
- *describe processes, such as catalytic cracking, for obtaining economically important compounds from fossil fuels*
- *explain the traditional uses of tar sands (pitch) as caulking for canoes and the use of animal oils and fats as fuels*

20–A3.2sts discuss the appropriateness, risks and benefits of technologies, assessing each potential application from a variety of perspectives, including sustainability **(ST7) [ICT F2–4.2, F3–4.1]**
- *identify challenges when taking scientific knowledge from the laboratory and applying the knowledge to large-scale manufacturing processes or to the development of products, considering such things as the supply of raw materials, energy, labour and the storage and disposal of waste products.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will describe the properties of simple hydrocarbons and describe hydrocarbon-based industrial processes that are important in Alberta.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

20–A3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- describe procedures for safe handling, storage and disposal of materials used in the laboratory, with reference to WHMIS and consumer product labelling information **(IP–ST3, PR–NS5)**
- design a procedure to identify types of selected hydrocarbons **(IP–NS1, IP–NS2)**.

Performing and Recording

Students will:

20–A3.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform an experiment to compare reactivities of selected hydrocarbons **(PR–NS2, PR–NS3, PR–NS5) [ICT C6–4.1]**
- build molecular models, depicting the structures of selected hydrocarbons **(NS6a, PR–NS4)**.

Analyzing and Interpreting

Students will:

20–A3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- *collect data on melting and boiling points of hydrocarbons and illustrate trends using charts, graphs or tables* **(PR–NS4, AI–NS2) [ICT C1–4.1, C6–4.3, C7–4.2]**.

Communication and Teamwork

Students will:

20–A3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- follow appropriate IUPAC guidelines in writing the names and formulas of selected hydrocarbons **(CT–NS2)**
- *use teamwork to collect information and write a report that describes fractional distillation to refine petroleum and catalytic cracking to produce ethene* **(CT–NS1, CT–NS2) [ICT C1–4.1, C1–4.4]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit B: Changes in Motion

Themes: Change, Energy and Systems

Overview: Motion is an important aspect of our lives, and the understanding of the effects of force on motion has many technological applications. Students learn that these applications can range from the design of safer roads and sports equipment to the investigation of traffic accidents. In this unit, students investigate the concepts of displacement, velocity, acceleration, force, momentum and mechanical energy and consider the relationships among them.

This unit builds on:
- Grade 8 Science, Unit D: Mechanical Systems
- Science 10, Unit B: Energy Flow in Technological Systems

This unit provides a background for:
- Science 30, Unit C: Electromagnetic Energy

Unit B will require approximately 25% of the time allotted for Science 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit B but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• properties of linear functions	Pure Mathematics 10, specific outcome 4.6; Applied Mathematics 10, specific outcomes 5.1, 5.2 and 5.7
• vector addition	Pure Mathematics 10, specific outcomes 6.1 and 6.2; Applied Mathematics 30, specific outcomes 5.1 to 5.4
• formula manipulation	Applied Mathematics 10, specific outcome 5.1
• graphing and interpreting data	Pure Mathematics 10, specific outcome 3.1; Applied Mathematics 10, specific outcome 3.1

Focusing Questions: How does the design of safety equipment and systems take into account concepts of changes in motion and forces? What has been the influence of society on the development of safety technology, and what are the contextual constraints and limits of these technological solutions?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. describe one-dimensional motion of objects in terms of displacement, time, velocity and acceleration
2. describe and analyze the law of conservation of momentum for one-dimensional collisions and change in momentum (impulse) to explain how force affects motion.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.
- displacement, time, velocity, acceleration
- conservation of momentum in one dimension
- impulse and force
- Newton's laws of motion
- application of laws of motion and principles of momentum in the design of sports equipment and transportation safety devices

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General Outcome 1
Students will describe one-dimensional motion of objects in terms of displacement, time, velocity and acceleration.

Specific Outcomes for Knowledge

Students will:

20–B1.1k distinguish between scalar and vector quantities, including distance and displacement, speed and velocity

20–B1.2k define velocity and acceleration as $\vec{v} = \Delta\vec{d} / \Delta t$ and $\vec{a} = \Delta\vec{v} / \Delta t$, respectively

20–B1.3k compare and contrast displacement in uniform motion and uniformly accelerated motion, using the following relationships: $\Delta\vec{d} = \vec{v}_i \Delta t + \frac{1}{2}\vec{a}\Delta t^2$ and $\Delta\vec{d} = \frac{\left(\vec{v}_i + \vec{v}_f\right)}{2}\Delta t$.

Note: Students are not expected to rearrange formulas if they require the quadratic equation.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

20–B1.1sts explain that the goal of technology is to provide solutions to practical problems **(ST1) [ICT F2–4.4]**

- *apply principles of one-dimensional uniform motion to relevant traffic safety design features, such as safe lengths of freeway entrance and exit ramps, traffic lights with advance warning flashers, types of intersections and length of time lights stay yellow*
- *analyze the design of stop-and-go zones and propose improvements to the design of traffic lights and intersections*

20–B1.2sts explain that science and technology have influenced, and been influenced by, historical development and societal needs **(SEC2) [ICT F2–4.8]**

- *describe the influence of societal perceptions of risk and the influence of scientific knowledge on the development of safety technologies designed to control changes in motion.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will describe one-dimensional motion of objects in terms of displacement, time, velocity and acceleration.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

20–B1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *determine what needs to be measured and select the proper procedures, tools and technologies for investigating the relationships among displacement, velocity and acceleration* **(IP–ST3) [ICT C6–4.4]**
- *design a study to assess the design of traffic lights and intersections* **(IP–ST1)**.

Performing and Recording

Students will:

20–B1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- manipulate and present data, using appropriate tools, such as scientific instrumentation, calculators, databases or spreadsheets, for analyzing displacement, velocity and acceleration **(PR–NS4) [ICT P2–4.1]**
- use technologies effectively and accurately for collecting data on motion; *e.g., photogate, computer-based laboratories, stopwatches, weighing balances* **(PR–NS2) [ICT F1–4.2]**
- *use library and electronic research tools to collect information in determining risks associated with sporting activities and transportation-related activities* **(PR–SEC1) [ICT C1–4.1, C3–4.2]**.

Analyzing and Interpreting

Students will:

20–B1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze position-time and velocity-time graphs to infer the relationships among displacement, velocity and acceleration **(AI–NS2) [ICT C7–4.2]**
- solve, quantitatively, one-dimensional uniform motion and uniformly accelerated motion problems using $\Delta\vec{d} = \vec{v}_i\Delta t + \frac{1}{2}\vec{a}\Delta t^2$ and $\Delta\vec{d} = \frac{\left(\vec{v}_i + \vec{v}_f\right)}{2}\Delta t$ **(AI–NS3) [ICT C6–4.1]**.

Communication and Teamwork

Students will:

20–B1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *use advanced menu features within a word processor to insert tables, graphs, text and graphics into a report* **(CT–ST2) [ICT P4–4.3]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe and analyze the law of conservation of momentum for one-dimensional collisions and change in momentum (impulse) to explain how force affects motion.

Specific Outcomes for Knowledge

Students will:

20–B2.1k define momentum as a vector quantity equal to the product of the mass and velocity of an object ($\vec{p} = m\vec{v}$)

20–B2.2k apply the law of conservation of momentum to one-dimensional collisions and explosions

20–B2.3k define change in momentum as impulse $\left(\Delta\vec{p} = m\Delta\vec{v} = \vec{F}_{ave}\Delta t\right)$, relate impulse to acceleration and Newton's second law of motion $\left(\Delta\vec{p}/\Delta t = m\vec{a} = \vec{F}\right)$, and apply the concept of impulse to explain the functioning of a variety of safety devices; *e.g., air bags, collapsible frames, bumpers, seat belts in cars, restraining nets and crash barriers on highways, collapsible steering wheels, padded dashboards, padded helmets, padded goggles and padded gloves, all of which are designed to increase the stopping time or time of contact by reducing acceleration and, thereby, force*

20–B2.4k explain how an unbalanced force causes change in motion and apply Newton's first law of motion to explain an object's state of rest or uniform motion; *e.g., movement of passengers in a moving car that accelerates or is coming to a stop*

20–B2.5k apply Newton's second law of motion and use it to relate force, mass and motion; *e.g., as an explanation of a whiplash injury from a rear-end collision*

20–B2.6k apply Newton's third law of motion to explain the interaction between two objects; *e.g., collision between two cars*

20–B2.7k relate, quantitatively, potential and kinetic energy to work done.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

20–B2.1sts explain that the goal of technology is to provide solutions to practical problems **(ST1) [ICT F2–4.4]**

- *explain the need for safety technologies and regulations for transportation and sporting situations*
- *trace the development of safety technologies in sports or transportation over the past 50 years, and compare the functioning of first- and current-generation safety technologies, such as sports safety equipment (helmets, shin guards, gloves) and automobile safety devices (lap belts, shoulder belts, air bags)*

20–B2.2sts explain that decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b) [ICT F2–4.2, F2–4.8, F3–4.1]**

- *analyze automobile and sports equipment safety features with a view to reducing risks within contextual constraints, such as costs, materials, weight, requirements for sustainability, rules and regulations*

20–B2.3sts explain that the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7) [ICT F3–4.1]**

- *list and assess the risks in a variety of day-to-day transportation and sporting situations, and describe the technologies designed to reduce the risk of injury.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe and analyze the law of conservation of momentum for one-dimensional collisions and change in momentum (impulse) to explain how force affects motion.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

20–B2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- identify questions to investigate that arise from practical problems and issues; *e.g., "How can sports equipment be made to increase its protective capacity?", "Do you increase protection or change the rules to make sports such as soccer or hockey safer?"* **(IP–ST1)**
- *use spreadsheets to analyze the law of conservation of momentum* **(IP–ST3) [ICT C6–4.2, P2–4.1]**.

Performing and Recording

Students will:

20–B2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- compile and organize data on the risk of injury and death related to seat belt and air bag use **(PR–NS4) [ICT C6–4.2, P2–4.1]**
- *test materials for use as seat belts or as padding for sports equipment* **(PR–ST2)**.

Analyzing and Interpreting

Students will:

20–B2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- solve one-dimensional collision and explosion problems, using scale diagrams and numerical calculations; *e.g., apply* $m_1\vec{v}_1 + m_2\vec{v}_2 = m_1\vec{v}_1' + m_2\vec{v}_2'$ *to traffic accidents involving two vehicles* **(AI–ST3) [ICT C6–4.1, P2–4.1]**
- *delineate cause and effect or correlation among the use of seat belts or air bags, seat belt legislation and reduction of fatalities* **(AI–NS6) [ICT C7–4.2]**
- *suggest a variety of alternatives to reduce whiplash injury caused by rear-end collisions and evaluate each alternative* **(AI–ST2) [ICT C2–4.1]**
- *develop criteria and use them to assess a device for reducing whiplash injury* **(AI–ST1)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe and analyze the law of conservation of momentum for one-dimensional collisions and change in momentum (impulse) to explain how force affects motion.

Communication and Teamwork

Students will:

20–B2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *consult a wide variety of sources that reflect varied viewpoints on particular topics, such as legislation of seat belt use* **(CT–SEC4) [ICT C2–4.1]**
- *work cooperatively with team members, using library and electronic research tools to collect information in determining risks associated with sports- and transportation-related activities* **(PR–SEC2, CT–NS1) [ICT C1–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit C: The Changing Earth

Themes: Change, Diversity, Energy and Systems

Overview: The history of our planet is one of change. There is evidence not only that Earth's surface is changing but that this change has, in turn, dramatically impacted the climate and life forms on Earth over time. In this unit, students examine scientific evidence for natural causes of climate change, for changing life forms and for continual changes to the Earth's surface.

This unit builds on:
- Grade 7 Science, Unit E: Planet Earth
- Science 10, Unit D: Energy Flow in Global Systems

This unit provides a background for:
- Science 30, Unit D: Energy and the Environment

Unit C will require approximately 25% of the time allotted for Science 20.

Links to Mathematics: The following mathematics topics are related to the content of Unit C but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• graphing and interpreting data	Pure Mathematics 10, specific outcome 3.1; Applied Mathematics 10, specific outcome 3.1
• measurement	Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: What is the scientific evidence of change to Earth? How has this evidence been used to formulate scientific theories? What are the limitations of current theories in making predictions about future changes to Earth?

General Outcomes: There are four major outcomes in this unit.

Students will:

1. analyze the scientific evidence and explanations for geologic phenomena that occurred long ago or are taking place over a long period of time
2. analyze and assess the evidence to explain the theory of plate tectonics and the internal structure of Earth
3. analyze and assess the evidence provided by the fossil record of change in the environment and life forms over a period of 3.5 billion years
4. analyze the evidence of, and assess the explanations for, natural variations in Earth's climate over the last two million years.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- Earth's internal structure
- theory of plate tectonics
- energy transmission in earthquakes
- fossilization, radiometric dating and half-life
- major characteristics and life forms of past eras
- gradualism compared to punctuated equilibrium
- mass extinctions
- evidence of variations in Earth's climate

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General Outcome 1
Students will analyze the scientific evidence and explanations for geologic phenomena that occurred long ago or are taking place over a long period of time.

Specific Outcomes for Knowledge

Students will:

20–C1.1k describe the challenges in investigating the changes that take place over hundreds of millions of years to Earth's crustal plates, to past climates and to life forms

20–C1.2k describe, in general terms, how the theories of geologic processes have changed over time.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–C1.1sts explain that scientific knowledge is subject to change as new evidence becomes apparent and as laws and theories are tested and subsequently revised, reinforced, rejected or replaced **(NS4)**

- *refer to the contributions of Hutton, Lyell and Wegener to the development of theories of geologic processes*

20–C1.2sts explain that scientific knowledge may lead to the development of new technologies and that new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4, F2–4.8]**

- *explain the importance of technology in facilitating the study of changes to Earth's surface, climate and life forms (enhancing the gathering of data and the quality, accuracy and precision of data), considering such things as seismometers, radiometric dating technologies, sonar mapping of the ocean floor and the global positioning system (GPS) to measure plate movement.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will analyze the scientific evidence and explanations for geologic phenomena that occurred long ago or are taking place over a long period of time.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–C1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- state a prediction and a hypothesis based on available evidence and background information or theory; *e.g., use available data to predict the position of land masses 1000 years from now* **(IP–NS3) [ICT C7–4.2]**.

Performing and Recording

Students will:

20–C1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *create a chart that shows the relationships among geological era, position of the continental plates and climate* **(PR–NS4) [ICT C6–4.3, C7–4.2]**.

Analyzing and Interpreting

Students will:

20–C1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- *assess the authority, reliability and validity of electronically accessed information about changes to Earth* **(AI–NS4) [ICT C3–4.1]**.

Communication and Teamwork

Students will:

20–C1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *select and use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate about the geology of Earth* **(CT–NS2)**
- *synthesize information about the changing Earth from multiple sources, or from complex and lengthy texts; record relevant data for acknowledging sources of information; and cite sources correctly* **(CT–NS2) [ICT F3–4.2, F3–4.3]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will analyze and assess the evidence to explain the theory of plate tectonics and the internal structure of Earth.

Specific Outcomes for Knowledge

Students will:

20–C2.1k describe how energy from earthquakes is transmitted by seismic waves

20–C2.2k describe the relationship between the Richter scale and an earthquake's ground motion and energy

20–C2.3k identify primary and secondary seismic waves (P- and S-waves, respectively) and longitudinal and transverse surface waves on the basis of vibration and direction of propagation and potential for destruction

20–C2.4k explain how seismic waves are used to better understand the internal structure of Earth

20–C2.5k identify and describe the layers of Earth (i.e., lithosphere, asthenosphere, mesosphere, outer core and inner core) as classified by the physical properties of density, rigidity and thickness

20–C2.6k list and describe the evidence that supports the theory of plate tectonics; i.e., location of volcanoes and earthquakes, ocean floor spreading, mountain ranges, age of sediments, paleomagnetism

20–C2.7k explain how convection of molten material provides the driving force of plate tectonics, and explain the tentativeness of the explanation that radioactive decay is the source of geothermal energy for plate tectonics.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–C2.1sts explain that concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**

- *assess the theory of plate tectonics in terms of its ability to explain and predict changes to Earth's surface*

20–C2.2sts explain that science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.4, F2–4.8]**

- *describe the limitations of current knowledge in predicting earthquakes and the need for more accurate predictions.*

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General Outcome 2
Students will analyze and assess the evidence to explain the theory of plate tectonics and the internal structure of Earth.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–C2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- define and delimit problems, *e.g., how to locate the approximate epicentre of an earthquake,* using data provided to facilitate investigation **(IP–NS1)**
- *design an experiment to test the effect of a simulated earthquake on a model building* **(IP–NS2)**
- *investigate Canada's earthquake-prone areas and predict likely locations of a future earthquake* **(IP–NS3) [ICT C7–4.2]**.

Performing and Recording

Students will:

20–C2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *compile and organize data to investigate monthly occurrences of earthquakes, their intensity and their locations around the world* **(PR–NS4) [ICT C7–4.2, P2–4.1]**.

Analyzing and Interpreting

Students will:

20–C2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- *estimate, predict, check and validate calculations when determining the location of earthquakes* **(AI–NS3) [ICT C6–4.1, F1–4.2]**
- *compare the theories of continental drift and plate tectonics* **(AI–SEC1) [ICT C2–4.2]**
- *investigate the application of seismic and surface waves in the design of earthquake-resistant buildings* **(AI–ST4)**.

Communication and Teamwork

Students will:

20–C2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *use advanced menu features within a word processor to insert tables, graphs, text and graphics and select and use multimedia capabilities for presentation* **(CT–NS2) [ICT P3–4.1, P4–4.3]**.

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General Outcome 3
Students will analyze and assess the evidence provided by the fossil record of change in the environment and life forms over a period of 3.5 billion years.

Specific Outcomes for Knowledge

Students will:

20–C3.1k explain how knowledge of radioisotopes, radioactive decay and half-lives are used to estimate the age of minerals and fossils

20–C3.2k describe common types of fossilization, i.e., actual remains, molds or imprints, tracks, trails or burrows, as direct evidence of evolution and describe the significance of the fossil record in Canada's Burgess Shale

20–C3.3k explain how sedimentary rock layers along with fossils can provide evidence of chronology, paleoclimate, evolution and mass extinctions; *e.g., index and transitional fossils, fossils of reptiles and certain types of plants usually indicate a warm, tropical climate*

20–C3.4k describe, in general terms, the major characteristics and life forms of the four eras: Precambrian, Paleozoic, Mesozoic and Cenozoic

20–C3.5k explain why oxygen became a significant component of Earth's atmosphere after the evolution of plants and chlorophyll.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–C3.1sts explain that scientific knowledge may lead to the development of new technologies and that new technologies may lead to or facilitate scientific discovery **(ST4) [ICT F2–4.4, F2–4.8]**

- *explain the importance of technology in facilitating the study of changes to Earth's climate and life forms (enhancing the gathering of data and the quality, accuracy and precision of data), considering such things as radiometric dating technologies, sonar mapping of the ocean floor and the global positioning system (GPS) to measure plate movement*

20–C3.2sts explain that scientific knowledge is subject to change as new evidence becomes apparent and as laws and theories are tested and subsequently revised, reinforced, rejected or replaced **(NS4) [ICT C7–4.2]**

- *discuss probable causes of, and geologic evidence for, mass extinctions and contrast these causes with the forces driving the current decline in species.*

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General Outcome 3
Students will analyze and assess the evidence provided by the fossil record of change in the environment and life forms over a period of 3.5 billion years.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–C3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- use stratigraphic evidence of one location to predict geologic structures in a neighbouring region **(IP–NS3) [ICT C6–4.1, C7–4.2]**.

Performing and Recording

Students will:

20–C3.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *compile and organize data, using appropriate formats and data treatments to facilitate interpretation, when determining climatic conditions based on fossil evidence* **(PR–NS4) [ICT C6–4.2, P2–4.1]**.

Analyzing and Interpreting

Students will:

20–C3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- interpret simple stratigraphic sequences **(AI–NS2) [ICT C7–4.2]**
- apply units of geological time; i.e., eras, periods and epochs **(AI–NS1)**
- interpret decay curves of elements commonly used for radioactive dating **(AI–NS2) [ICT C7–4.2]**
- *describe earlier life forms on the basis of fossil evidence, identify and explain sources of error, and express results in a form that acknowledges the degree of uncertainty* **(AI–NS4)**.

Communication and Teamwork

Students will:

20–C3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *prepare a group presentation, summarizing the arguments for gradualism and punctuated equilibrium as two possible patterns of evolution* **(CT–NS1) [ICT P6–4.1]**
- *evaluate individual and group processes used in planning and carrying out an investigation, based on fossil evidence, into changes in life forms* **(CT–NS3)**.

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General Outcome 4
Students will analyze the evidence of, and assess the explanations for, natural variations in Earth's climate over the last two million years.

Specific Outcomes for Knowledge

Students will:

20–C4.1k describe the geologic evidence for repeated glaciation over large areas of Canada and in their local area; *e.g., the Cypress Hills, gold deposits in the Yukon, topography, drainage patterns, erratics, U-shaped valleys*

20–C4.2k explain how ice cores from polar icecaps provide evidence of warming and cooling in the past hundred thousand years

20–C4.3k explain, in general terms, how changes to Earth's climate and how mass extinctions could be caused by changes or variation in the following: Earth's orbit around the sun, the inclination of Earth's axis, solar energy output, Earth's geography due to crustal movement, volcanic activity, ocean currents, atmospheric composition or asteroid impact.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–C4.1sts explain that concepts, models and theories are often used in interpreting and explaining observations and in predicting future observations **(NS6a)**

- *describe the limitations of current geological models in predicting future changes to climate.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 4
Students will analyze the evidence of, and assess the explanations for, natural variations in Earth's climate over the last two million years.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–C4.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design a plan for surveying data on ice core samples from ice fields around the world for a study of climate over the last two million years **(IP–NS1, IP–NS4)**.

Performing and Recording

Students will:

20–C4.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- select relevant ice-core data for a study of climate over the last two million years **(PR–NS4)**
- *view a glacier in aerial photographs and document the changes that have occurred over time* **(PR–NS4) [ICT C7–4.2]**.

Analyzing and Interpreting

Students will:

20–C4.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- identify and explain sources of error and uncertainty in measurement when describing past climates based on ice-core data and express results in a form that acknowledges the degree of uncertainty **(AI–NS4)**
- *distinguish between correlation and cause and effect when describing the relationship between climate change and mass extinction* **(AI–NS6) [ICT C7–4.2]**
- *identify new questions or problems that arise from what was learned, such as: "Is the current rate of species extinction the same as in periods of mass extinction in the past?"* **(AI–NS5)**.

Communication and Teamwork

Students will:

20–C4.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *synthesize information from multiple sources when making inferences about global warming and climate change, recording relevant data, acknowledging sources of information and citing sources correctly* **(CT–SEC2) [ICT C7–4.2, F3–4.2, F3–4.3]**.

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Unit D: Changes in Living Systems

Themes: Energy, Equilibrium, Change and Systems

Overview: Matter cycles and energy dissipates through the biosphere and its component ecosystems. The concept of an ecosystem is used to explain energy flow and nutrient recycling and to quantify large-scale and long-term processes. Students will study habitat destruction, ecological succession and changes to populations, focusing on the need to balance the interests of a growing human population with sustainable ecosystems.

This unit builds on:
- Grade 9 Science, Unit A: Biological Diversity
- Science 10, Unit D: Energy Flow in Global Systems

This unit provides a background for:
- Science 30, Unit A: Living Systems Respond to Their Environment

Unit D will require approximately 25% of the time allotted for Science 20.

Links to Mathematics: None

Focusing Questions: What are the characteristics of an ecosystem? How does matter cycle and energy flow through the biosphere and through ecosystems, and what are the implications of this knowledge in terms of protecting the environment for future generations? How do ecosystems and organisms change over time and respond to natural and human interventions?

General Outcomes: There are three major outcomes in this unit.

Students will:

1. analyze ecosystems and ecological succession in the local area and describe the relationships and interactions among subsystems and components
2. analyze and investigate the cycling of matter and the flow of energy through the biosphere and ecosystems as well as the interrelationship of society and the environment
3. analyze and describe the adaptation of organisms to their environments, factors limiting natural populations, and evolutionary change in an ecological context.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the outcomes.

- biotic and abiotic factors
- population size
- primary and secondary succession
- habitat destruction, reclamation
- species diversity
- human interventions in biogeochemical (nitrogen, carbon, water) cycles
- autotrophs, heterotrophs, food chains, food webs
- trophic levels, biomass, energy and pyramids
- human population growth, biodiversity and carrying capacity
- adaptation of organisms, natural selection
- evidence for the theory of evolution

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General Outcome 1
Students will analyze ecosystems and ecological succession in the local area and describe the relationships and interactions among subsystems and components.

Specific Outcomes for Knowledge

Students will:

20–D1.1k investigate and analyze an aquatic or a terrestrial local ecosystem, distinguish between biotic and abiotic factors, describe how these factors affect population size and
- infer the abiotic effects on life; *e.g., light, nutrients, water, temperature*
- infer biotic interactions; *e.g., predator-prey relationships, competition, symbiotic relationships*
- infer the influence of biota on the local environment; *e.g., microclimates, soil, nutrients*

20–D1.2k describe the key stages of primary succession in a specific ecosystem and the nature of its climax community; *e.g., spruce bog, sand dune, pond, prairie*

20–D1.3k differentiate between primary and secondary succession in a specific aquatic and a specific terrestrial ecosystem, *e.g., pond, river, lake, forest, parkland*, and compare natural and artificial means to initiate secondary succession in an ecosystem, *e.g., reforestation or regrowth after a forest fire, flood or other natural disaster, strip mining, clearcutting, controlled burns by some Aboriginal groups promoting grassland biome regeneration*

20–D1.4k describe the potential impact of habitat destruction on an ecosystem

20–D1.5k describe the effects of introducing a new species into, or largely removing an established species from, an environment; *e.g., zebra mussel, carp and the Eurasian milfoil in Canada's lakes, purple loosestrife in Alberta, the horse or the buffalo in the plains region of Alberta.*

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

20–D1.1sts describe how society provides direction for scientific and technological development **(SEC4) [ICT F2–4.4]**
- *discuss public support of scientific work on predator-prey relationships as part of wildlife management in national and provincial parks (introduction of wolves, for example)*

20–D1.2sts explain that society and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F2–4.8, F3–4.1]**
- *discuss, in terms of scientific principles, how reforestation projects change the direction of secondary succession in a natural ecosystem*
- *assess the long-term implications of fire control and prevention on population and ecosystem stability, diversity and productivity*
- *assess habitat loss and the responsibility of society to protect the environment for future generations*
- *analyze the need for habitat reclamation, such as recreating wetlands and swamps, forests, and prairie grasslands, and describe steps to ensure species diversity.*

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General Outcome 1
Students will analyze ecosystems and ecological succession in the local area and describe the relationships and interactions among subsystems and components.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

20–D1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design a model to explain the relationship between populations of predator and prey, outlining the characteristics of each that adapt them to their trophic level* **(IP–NS2)**
- *inquire into the effect of logging on predation levels of deer as well as on food sources for deer* **(IP–NS1)**
- *design an experiment and identify specific variables to investigate relationships between biotic and abiotic elements of a micro-ecosystem* **(IP–NS2)**
- *evaluate and select appropriate procedures and technology to measure the impact of introducing species X into a specific environment* **(IP–NS4) [ICT C6–4.5]**.

Performing and Recording

Students will:

20–D1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- perform a field study; measure, qualitatively and quantitatively, appropriate biotic and abiotic factors in the aquatic or terrestrial ecosystem chosen; and present data in a form that describes, in general terms, the structure of the ecosystem; *e.g., pH, temperature, precipitation, water hardness, turbidity, dissolved oxygen content, humidity, wind, light intensity, soil composition, plants, animals, micro-organisms* **(PR–NS4) [ICT C6–4.2]**
- *use library and electronic research tools to collect information on a given topic, such as:*
  - *protection of the environment as a priority over economic interest*
  - *endangered species of the world*
  - *the Convention on Biological Diversity*
  - *sustainable development initiatives* **(PR–NS4) [ICT C1–4.1, C3–4.2]**.

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General Outcome 1
Students will analyze ecosystems and ecological succession in the local area and describe the relationships and interactions among subsystems and components.

Analyzing and Interpreting

Students will:

20–D1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze field study data to identify the interrelationships of biotic and abiotic components of the ecosystem studied; *e.g., dominant plants, micro-climates and habitats, niches and interrelationships of biota* **(AI–NS1, AI–NS2) [ICT C7–4.2]**
- *tabulate, graph and interpret relevant data collected from observations of succession in a micro-climate (hay infusion, for example)* **(AI–NS2) [ICT C6–4.3]**
- *analyze statistical data in diagrams, tables and graphs as part of a briefing for a public hearing on a proposed mineral exploration in an ecologically or a culturally sensitive area* **(AI–NS2, AI–NS3, AI–NS4) [ICT C7–4.2]**
- *analyze the information presented by opposing sides on an environmental issue, such as that of an environmental group and that of an industry representative, to determine bias* **(AI–NS4, AI–SEC1) [ICT C2–4.1, C2–4.2]**
- *identify new questions that arise from investigations, such as: "Should naturally occurring forest fires be fought?"* **(AI–NS5).**

Communication and Teamwork

Students will:

20–D1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *elicit feedback from others on an environmental issue* **(CT–NS1)**
- *participate in a variety of electronic group formats to gather and share information about environmental issues* **(CT–NS1) [ICT C5–4.2]**
- *prepare a visual display that explains initiatives undertaken by industry to protect the environment* **(CT–NS2) [ICT P4–4.2].**

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General Outcome 2
Students will analyze and investigate the cycling of matter and the flow of energy through the biosphere and ecosystems as well as the interrelationship of society and the environment.

Specific Outcomes for Knowledge

Students will:

20–D2.1k outline the biogeochemical cycles of nitrogen, carbon, oxygen and water and, in general terms, describe their interconnectedness, building on knowledge of the hydrologic cycle from Science 10, Unit D

20–D2.2k describe artificial and natural factors that affect the biogeochemical cycles:

- nitrogen cycle; *e.g., automobile, agricultural and industrial contributions to NO_x combining with water to produce nitric acid, nitrogen in manure and fertilizers*
- carbon cycle; *e.g., emissions of carbon oxides from extraction, distribution and combustion of fossil fuels, releases associated with deforestation and cement industries*
- water cycle; *e.g., extraction of ground water, dams for hydro-electricity and irrigation*

20–D2.3k analyze and describe how energy flows in an ecosystem, using the concepts of conservation of energy (second law of thermodynamics); energy input and output through trophic levels, food webs, chains and pyramids; and specific examples of autotrophs and heterotrophs

20–D2.4k explain why population size and biomass are both directly related to the trophic level of the species and explain how trophic levels can be described in terms of pyramids of numbers, biomass or energy.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

20–D2.1sts explain that science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F2–4.8, F3–4.1]**

- *assess whether the efforts to reduce human impact on biogeochemical cycles are viable, taking into consideration a variety of perspectives (considerations for deep-well and deep-ocean injection of wastes, for example, include properties of waste, concentration, uncertainty, environmental concerns, risks and benefits to human health and organisms, costs)*
- *evaluate the influence of society, and the impact of a variety of technologies, on the nitrogen cycle*
- *discuss the use of water by society, the impact such use has on water quality and quantity in ecosystems, and the need for water purification and conservation, considering such things as manufacturing, the oil industry, agricultural systems, the mining industry and domestic daily water consumption*

20–D2.2sts explain that science and technology are developed to meet societal needs and expand human capabilities **(SEC1) [ICT F2–4.8]**

- *contrast the diet of people in developing countries and that of people in developed countries in terms of energy efficiency and environmental impact, and describe ways to address potential food shortages in the future.*

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General Outcome 2
Students will analyze and investigate the cycling of matter and the flow of energy through the biosphere and ecosystems as well as the interrelationship of society and the environment.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

20–D2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design an investigation to compare the carbon dioxide production of plants with that of animals* **(IP–NS1, IP–NS2, IP–NS3, IP–NS4)**
- *hypothesize how alternations in the carbon cycle as a result of the burning of fossil fuels might affect other biogeochemical cycles (sulfur, iron and water, for example)* **(IP–NS3)**
- *predict disruptions in the nitrogen cycle that are caused by human activities* **(IP–NS3)**.

Performing and Recording

Students will:

20–D2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- draw, by hand or using technology, annotated diagrams of energy flow in food chains, webs and pyramids **(PR–NS4)**.

Analyzing and Interpreting

Students will:

20–D2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- describe alternative ways of presenting energy-flow data for ecosystems: pyramid of biomass, of numbers or of energy **(AI–NS4, AI–NS5, AI–NS6)**
- *evaluate the relevance, reliability and adequacy of data and data-collection methods, including assessing the authority, reliability and validity of electronically accessed information* **(AI–NS4) [ICT C3–4.1, C3–4.2]**
- *evaluate the appropriateness of a technology, such as deep-well injection of wastes, to solve a problem* **(AI–SEC2) [ICT C6–4.5]**.

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General Outcome 2
Students will analyze and investigate the cycling of matter and the flow of energy through the biosphere and ecosystems as well as the interrelationship of society and the environment.

Communication and Teamwork

Students will:

20–D2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *use advanced menu features within a word processor to insert tables, graphs, text and graphics in food webs and energy budgets for various trophic levels in an ecosystem* **(CT–NS2) [ICT P4–4.3]**
- *make arguments on an issue such as the expansion of housing and other amenities in Banff National Park or Jasper National Park* **(CT–SEC3) [ICT C2–4.1, C7–4.2]**
- *work cooperatively in a group to investigate the influence of human activities on the biogeochemical cycles and, using appropriate multimedia, present the findings* **(CT–SEC1, CT–SEC2) [ICT P3–4.1]**.

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General Outcome 3
Students will analyze and describe the adaptation of organisms to their environments, factors limiting natural populations, and evolutionary change in an ecological context.

Specific Outcomes for Knowledge

Students will:

20–D3.1k describe mutation as the principal cause for variation of genes in species and populations, identify the role of sexual reproduction in generating variability among individuals and describe the forces that drive evolution

20–D3.2k describe the adaptation of species over time due to variation in a population, population size and environmental change; *e.g., bacterial resistance to antibiotics, giraffe neck length, gazelle speed*

20–D3.3k describe evidence for evolution by natural selection; *e.g., fossils, biogeography, embryology, homologous and vestigial structures, biochemical research*

20–D3.4k compare gradual evolution with punctuated equilibrium

20–D3.5k describe how factors including space, accumulation of wastes (*e.g., salinization of soil*), competition, technological innovations, irrigation practices (*e.g., Hohokam farmers*) and the availability of food impact the size of populations

20–D3.6k compare the growth pattern of the human population to that of other species.

Specific Outcomes for Science, Technology and Society (STS) (Nature of Science Emphasis)

Students will:

20–D3.1sts explain that scientific knowledge and theories develop through hypotheses, the collection of evidence through investigation and the ability to provide explanations **(NS2)**

- *discuss the nature of science as a way of knowing, considering the contributions of Buffon, Lyell, Malthus and Wallace to the theory of evolution*
- *describe how paleontology has provided invaluable data in the attempt to explain observable variations in organisms (horse, fish) over time*
- *compare Lamarckian and Darwinian explanations of evolutionary change.*

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General Outcome 3
Students will analyze and describe the adaptation of organisms to their environments, factors limiting natural populations, and evolutionary change in an ecological context.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

20–D3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design an investigation to measure or describe an inherited variation in a plant or an animal population* **(IP–NS1, IP–NS2, IP–NS3, IP–NS4)**.

Performing and Recording

Students will:

20–D3.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- gather data, actual or simulated, on organisms to demonstrate how inherited characteristics change over time; *e.g., Darwin's finches, bacteria, domestic plants and animals* **(PR–NS1, PR–NS4)**.

Analyzing and Interpreting

Students will:

20–D3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze data, actual or simulated, on organisms to demonstrate how inherited characteristics change over time; *e.g., Darwin's finches, bacteria, domestic plants and animals* **(AI–NS2) [ICT C7–4.2]**
- demonstrate and assess the effect of environmental factors on population growth curves **(AI–NS2, AI–NS6) [ICT C7–4.2]**
- *use calculated or actual data to graph the growth of populations that demonstrate exponential growth and logistic growth* **(AI–NS2) [ICT C6–4.2, C6–4.3]**
- *apply the growth curve for open populations to identify the long-term impact on Earth's carrying capacity and the demands on natural resources for a growing human population* **(AI–NS2, AI–NS4, AI–NS6)**
- *analyze the processes governing the growth pattern of human populations that are different from those governing naturally occurring populations* **(AI–NS2) [ICT C7–4.2]**.

Communication and Teamwork

Students will:

20–D3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *discuss Darwin's impact on modern science and society* **(CT–NS1)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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SCIENCE 30

Science 30 consists of four units of study:

A. Living Systems Respond to Their Environment
B. Chemistry and the Environment
C. Electromagnetic Energy
D. Energy and the Environment

Attitude Outcomes

Students will be encouraged to develop positive attitudes that support the responsible acquisition and application of knowledge related to science and technology. The following attitude outcomes are to be developed throughout Science 30, in conjunction with the specific outcomes for Knowledge; Science, Technology and Society (STS); and Skills in each unit.

Interest in Science

Students will be encouraged to:
show interest in science-related questions and issues and confidently pursue personal interests and career possibilities within science-related fields; *e.g.,*

- *research the answers to questions they generate*
- *explore and use a variety of methods and resources to increase their knowledge and skills*
- *be critical and constructive when considering new theories and techniques*
- *use scientific vocabulary and principles in everyday discussions*
- *recognize the usefulness of being skilled in mathematics and problem solving*
- *be interested in science and technology topics not directly related to their formal studies*
- *recognize the importance of making connections between various science disciplines*
- *maintain interest in pursuing further studies in science*
- *explore where further science- and technology-related studies and careers can be pursued*
- *recognize that part-time jobs require science- and technology-related knowledge and skills.*

Mutual Respect

Students will be encouraged to:
appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds; *e.g.,*

- *use a multiperspective approach, considering scientific, technological, economic, cultural, political and environmental factors when formulating conclusions, solving problems or making decisions on an STS issue*
- *research carefully and discuss openly ethical dilemmas associated with the applications of science and technology*
- *explore personal perspectives, attitudes and beliefs toward scientific and technological advancements*
- *recognize the contribution of science and technology to the progress of civilizations*
- *show support for the development of technologies and science as they relate to human needs*
- *recognize that the scientific approach is one of many ways of viewing the universe*
- *recognize the research contributions of both men and women*
- *recognize the research contributions of Canadians.*

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Scientific Inquiry

Students will be encouraged to:
seek and apply evidence when evaluating alternative approaches to investigations, problems and issues; *e.g.,*

- *consider the social and cultural contexts in which a theory developed*
- *appreciate how scientific problem solving and the development of new technologies are related*
- *insist on evidence before accepting a new idea or a new explanation*
- *assess, critically, their opinion of the value of science and its applications*
- *question arguments in which evidence, explanations or positions do not reflect the diversity of perspectives that exist*
- *criticize arguments that are based on faulty, incomplete or misleading use of numbers*
- *recognize the importance of reviewing the basic assumptions from which a line of inquiry has arisen*
- *insist that the critical assumptions behind any line of reasoning be made explicit so that the validity of the position taken can be judged*
- *evaluate inferences and conclusions, being cognizant of the many variables involved in experimentation*
- *ask questions and conduct research to ensure understanding*
- *expend the effort and time needed to make valid inferences*
- *seek new models, explanations and theories when confronted with discrepant events.*

Collaboration

Students will be encouraged to:
work collaboratively in planning and carrying out investigations and in generating and evaluating ideas; *e.g.,*

- *provide the same attention and energy to the group's product as they would to a personal assignment*
- *be attentive when others speak, seek the point of view of others, and consider a multitude of perspectives*
- *use appropriate communication technology to elicit feedback from others*
- *participate in a variety of electronic group formats.*

Stewardship

Students will be encouraged to:
demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment; *e.g.,*

- *assume part of the collective responsibility for the impact of humans on the environment*
- *participate in civic activities related to the preservation and judicious use of the environment and its resources*
- *encourage their peers or members of their community to participate in a project related to sustainability*
- *consider all perspectives when addressing issues, weighing scientific, technological and ecological factors*
- *discuss both the positive and negative effects on human beings and society of environmental changes caused by nature and by humans*
- *participate in the social and political systems that influence environmental policy in their community*
- *promote actions that are not injurious to the environment*

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- *make personal decisions based on a feeling of responsibility toward less privileged parts of the global community and toward future generations*
- *be critical-minded regarding the short- and long-term consequences of sustainability.*

Safety

Students will be encouraged to:
show concern for safety in planning, carrying out and reviewing activities, referring to the Workplace Hazardous Materials Information System (WHMIS) and consumer product labelling information; *e.g.,*

- *consider safety a positive limiting factor in scientific and technological endeavours*
- *read the labels on materials before using them, interpret the WHMIS symbols and consult a reference document if safety symbols are not understood*
- *manipulate materials carefully, being cognizant of the risks and consequences of their actions*
- *assume responsibility for the safety of all those who share a common working environment by cleaning up after an activity and disposing of materials according to safety guidelines*
- *seek assistance immediately for any first aid concerns, such as cuts, burns or unusual reactions*
- *keep the work station uncluttered, ensuring that only appropriate laboratory materials are present*
- *criticize a procedure, a design or materials that are not safe or that could have a negative impact on the environment*
- *use safety and waste disposal as criteria for evaluating an experiment*
- *write safety and waste-disposal precautions into a laboratory procedure.*

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Unit A: Living Systems Respond to Their Environment

Themes: Energy, Equilibrium, Matter and Systems

Overview: The human body continually interacts with the external environment. In this unit, students learn that the circulatory system assists in this interaction between the blood cells and the external environment and, in combination with the immune system, defends the body against pathogens. Students apply the principles of heredity and molecular genetics to explain human disorders and to assess the risks and benefits of genetic technologies.

This unit builds on:

- Science 10, Unit C: Cycling of Matter in Living Systems
- Science 20, Unit D: Changes in Living Systems

Unit A will require approximately 25% of the time allotted for Science 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit A but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• probability	Applied Mathematics 30, specific outcomes 2.4, 2.5, 2.6 and 2.7
• measurement	Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: How do the structure and function of the human circulatory system help to maintain human health? What are the defense mechanisms of the human body? What are the basic principles of Mendelian genetics and how can they be applied to treat genetic diseases? What are the risks, benefits and associated ethical issues of current genetic technology?

General Outcomes: There are three major outcomes in this unit.

Students will:

1. analyze how the human circulatory system facilitates interaction between blood cells and the external environment and investigate cardiovascular health
2. analyze the defense mechanisms used by the human body to protect itself from pathogens found in the external environment
3. apply the principles of heredity and molecular genetics to explain how human diseases can arise from inherited traits, the risks and benefits of genetic technology, and the need for ethical considerations in the application of scientific knowledge.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the learning outcomes.

- structure and function of the circulatory system
- composition of human blood tissue and the role of blood
- immune response and defense mechanisms to pathogens
- cardiovascular health
- chromosomal behaviour
- principles of Mendelian genetics
- deoxyribonucleic acid DNA and protein synthesis
- mutations and gene therapy

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General Outcome 1
Students will analyze how the human circulatory system facilitates interaction between blood cells and the external environment and investigate cardiovascular health.

Specific Outcomes for Knowledge

Students will:

30–A1.1k describe the principal structures and associated blood vessels of the heart; i.e., ventricles, atria, septum, valves (specific names of valves not required), aorta, vena cavae, pulmonary arteries and veins, coronary arteries

30–A1.2k describe the rhythmic contraction of the heart and its function in the general circulation of blood through pulmonary and systemic pathways

30–A1.3k describe the structure and function of blood vessels and the flow of blood through arteries, arterioles, venules, veins and capillaries

30–A1.4k describe the main components of blood (i.e., plasma, red blood cells, white blood cells, platelets, blood proteins that include antibodies, hemoglobin and hormones) and their role in the transportation of substances (e.g., nutrients, wastes, gases, hormones), blood clotting, the defence against pathogens and the distribution of thermal energy.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–A1.1sts describe how society provides direction for scientific and technological development **(SEC4) [ICT F2–4.4, F2–4.8]**

- *investigate and explain the relationship between exercise, lifestyle, diet, gender and cardiovascular health by examining blood pressure, heart rate and cholesterol levels.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will analyze how the human circulatory system facilitates interaction between blood cells and the external environment and investigate cardiovascular health.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–A1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment to determine the effects of exercise, emotion, gender or chemicals such as caffeine on blood pressure and heart rate **(IP–NS2) [ICT C7–4.2]**.

Performing and Recording

Students will:

30–A1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- measure resting heart rate and blood pressure and determine the effects of exercise on both factors **(PR–NS2, PR–NS3)**
- observe prepared slides or electronic images of human blood **(PR–NS2) [ICT C1–4.2]**
- *perform a heart dissection to identify the major parts and to determine the directional flow of blood through the organ* **(PR–NS2, PR–NS4)**
- *use computer software or video programs to view the mechanics of heart function and associated blood flow including the functioning of the valves that control venous blood flow* **(PR–NS1) [ICT C6–4.4]**.

Analyzing and Interpreting

Students will:

30–A1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- map blood flow through a mammalian heart **(PR–NS4)**
- *research and plot the relationship between heart rate and the size of an organism* **(AI–NS2) [ICT C1–4.1, C6–4.3, C7–4.2]**
- *evaluate the validity of the hypothesis that blood flow can be explained on the basis of tidal forces* **(AI–NS6)**
- *extrapolate the number of heartbeats per year, or the volume of blood circulated in a year, based on their resting heart rate* **(AI–NS3) [ICT C6–4.1]**
- *compare a healthy person, an athlete and a person with cardiac disease in terms of oxygen demand, cardiac output and vessel blockage, using a simulation* **(AI–NS2, AI–NS6) [ICT C7–4.2, F1–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will analyze how the human circulatory system facilitates interaction between blood cells and the external environment and investigate cardiovascular health.

Communication and Teamwork

Students will:

30–A1.4s work collaboratively in addressing problems, and apply the skills and conventions of science in communicating information and ideas and in assessing results

- use appropriate International System of Units (SI) notation, fundamental and derived units and significant digits **(CT–NS2)**★
- use appropriate numeric, symbolic, graphical and linguistic modes of representation to communicate ideas, plans and results **(CT–NS2)**★
- *select and use multimedia capabilities to present findings on the influential role of various factors such as lifestyle and genetics on blood pressure* **(CT–NS2) [ICT C1–4.4, C7–4.3, P3–4.1, P6–4.1]**.

★To be developed throughout the course.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will analyze the defense mechanisms used by the human body to protect itself from pathogens found in the external environment.

Specific Outcomes for Knowledge

Students will:

30–A2.1k describe how pathogens in the environment *(e.g., mosquito-borne parasites, bacteria, viruses)* enter the circulatory system and may have an adverse affect on health

30–A2.2k describe, in general terms, the function of various body mechanisms, including the skin and body secretions (i.e., tears and stomach acid), in preventing pathogens from entering body tissues

30–A2.3k describe, in general terms, how immunity to pathogens develops, how the immune system responds to a foreign antigen and the roles of macrophages, B cells, helper T cells, killer T cells, suppressor T cells, memory cells and antibodies

30–A2.4k explain the interrelationship of autoimmune diseases and the human immune system; *e.g., multiple sclerosis, arthritis, lupus*

30–A2.5k analyze how vaccines defend against disease-causing bacteria and viruses.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–A2.1sts describe how society provides direction for scientific and technological development **(SEC4) [ICT F2–4.4, F2-4.8]**

- *describe how vaccination programs are beneficial in controlling epidemics or dealing with concerns about the spread of possible infection, such as tetanus, smallpox and influenza*
- *describe how improvements to sanitation, personal hygiene and the availability of potable water have greatly reduced the incidence of communicable diseases and discuss the ongoing need for vigilance and research into modes of transmission of such diseases as typhoid, cholera and gastrointestinal diseases.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will analyze the defense mechanisms used by the human body to protect itself from pathogens found in the external environment.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–A2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *select appropriate procedures and instruments to investigate the various ways the human body protects itself from diseases* **(IP–NS4) [ICT C6–4.4, C6–4.5]**
- *design a study to test the effectiveness of a drug, incorporating the use of a placebo into a double-blind study* **(IP–NS1, IP–NS2, IP–NS4).**

Performing and Recording

Students will:

30–A2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *conduct research and synthesize information on the various ways the human body protects itself from diseases* **(PR–NS1) [ICT C7–4.2]**
- *perform a biogeographical study to compare the incidence of disease, such as West Nile encephalitis, Ebola hemorrhagic fever or leprosy (Hansen's disease), in different regions of the world* **(PR–NS1) [ICT C7–4.2]**
- *simulate an immune response, using a model and/or computer simulation* **(PR–NS3).**

Analyzing and Interpreting

Students will:

30–A2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- *evaluate research on the development of a vaccine for the human immunodeficiency virus (HIV)* **(AI–SEC1)**
- *evaluate the use of anecdotal versus statistical evidence in validating a scientific interpretation or conclusion* **(NS5d, AI–NS4) [ICT C2–4.2]**
- *evaluate implications of findings to questions, such as why some individuals choose not to be vaccinated or why the incidence of tuberculosis is rising* **(AI–SEC4)**
- *assess both ethical and practical implications of using animals to test a drug or treatment intended for human application* **(AI–SEC4).**

Communication and Teamwork

Students will:

30–A2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *select and use multimedia capabilities to present findings on the effectiveness of vaccination on specific forms of disease, such as tuberculosis* **(CT–NS2) [ICT C1–4.4, C7–4.3, P3–4.1, P6–4.1].**

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will apply the principles of heredity and molecular genetics to explain how human diseases can arise from inherited traits, the risks and benefits of genetic technology, and the need for ethical considerations in the application of scientific knowledge.

Specific Outcomes for Knowledge

Students will:

30–A3.1k describe, in general, the behaviour of chromosomes during mitosis, meiosis and fertilization

30–A3.2k explain, with the aid of Punnett squares, the inheritance of single traits by applying current understanding of the gene, segregation and dominance

30–A3.3k distinguish autosomal from sex-linked patterns of inheritance

30–A3.4k describe the structure of DNA by:
- identifying the structure of DNA as a double helix
- listing the essential components of DNA as nucleotides
- identifying the base pairings between the strands of the double helix

30–A3.5k explain the general process of DNA replication

30–A3.6k describe a primary function of DNA by describing how an amino acid sequence of a polypeptide (protein) is determined by the sequence of DNA triplet codes, i.e., use of a table of DNA triplets matched with amino acids

30–A3.7k describe the role of proteins in the human body as regulatory molecules (enzymes), as structural molecules and as a source of energy

30–A3.8k describe how mutations in DNA affect the proteins produced resulting in human diseases; *e.g., sickle-cell anemia, hemophilia, Huntington's disease, cystic fibrosis*

30–A3.9k describe, in general terms, genetic engineering and its application to gene therapy and the development of genetically modified organisms

30–A3.10k describe the development of resistance in bacteria and viruses, based on the concepts of mutation, plasmid transfer, transformation and natural selection.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–A3.1sts explain that science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.8]**
- *explore the potential medical and ethical implications of the Human Genome project and other genome sequencing projects on society*
- *trace the development of plant and animal breeding techniques, starting with traditional practices (e.g., Hopi/Huron/Iroquois maize breeding), to Mendel's work on inheritance, to the contributions of many scientists on the discovery of the molecular structure of DNA and the development of recombinant DNA technology*

30–A3.2sts explain that decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b)**
- assess the risks and benefits of genetic technology and the need for ethical considerations; *e.g., stem-cell research, access to genetic screening, genetically modified organisms.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will apply the principles of heredity and molecular genetics to explain how human diseases can arise from inherited traits, the risks and benefits of genetic technology, and the need for ethical considerations in the application of scientific knowledge.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–A3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *make predictions about the probability of inheriting specific traits* **(IP–NS3) [ICT C6–4.1]**
- *define a testable question that would show environmental influences on diseases, such as type 2 diabetes, in different populations* **(IP–NS1)**
- *devise an experimental procedure to investigate a characteristic of an organism acquired through genetic engineering, such as genetically modified canola, corn or soybean* **(IP–NS4)**.

Performing and Recording

Students will:

30–A3.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- investigate, with the aid of a pedigree chart, the familial inheritance of a specific trait that is controlled by a single pair of genes **(PR–NS2)**
- *collect data on the frequency of hereditary diseases such as sickle cell anemia or Tay-Sachs disease in different populations of people* **(PR–NS1) [ICT C7–4.2]**
- *research, integrate and synthesize information on the relationship between mutagens found in the environment and the rate of mutation* **(PR–NS1) [ICT C7–4.2]**
- *research the relationship between the virulence of a pathogen and the degree of genetic heterogeneity within a population, such as the impact of disease introduced by Europeans to Indigenous North American peoples* **(PR–NS1) [ICT C7–4.2]**
- *simulate the production of proteins, using models* **(PR–NS3)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will apply the principles of heredity and molecular genetics to explain how human diseases can arise from inherited traits, the risks and benefits of genetic technology, and the need for ethical considerations in the application of scientific knowledge.

Analyzing and Interpreting

Students will:

30–A3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- interpret patterns and trends in data associated with autosomal and sex-linked inheritance **(AI–NS2) [ICT C6–4.2, C7–4.2]**
- predict, quantitatively, the probability of acquiring a particular trait in autosomal and sex-linked patterns of inheritance **(AI–NS2) [ICT C6–4.1]**
- *identify and evaluate potential applications of genetic engineering to health and agriculture* **(AI–SEC4) [ICT C2–4.1, F2–4.4]**
- *research and evaluate the long-term effect of the use of antibacterial soaps and antibiotics on bacterial populations* **(AI–NS2) [ICT C6–4.1, C7–4.2].**

Communication and Teamwork

Students will:

30–A3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively to investigate the inheritance of a human trait that is controlled by a single pair of genes, such as tongue rolling, attached earlobes* **(CT–NS1, CT–NS2)**
- *research, present and defend a position on genetically modified organisms* **(CT–SEC3) [ICT C1–4.4].**

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit B: Chemistry and the Environment

Themes: Change, Energy, Systems

Overview: In maintaining quality of life, society is becoming increasingly reliant upon chemical substances of life. These chemicals and their by-products can also adversely affect the environment and living systems. A knowledge of chemistry is essential to fully understand the benefits and risks of chemicals to humankind and in monitoring the emission of these substances into the environment. In this unit, students examine the impacts of acids and bases, organic compounds and air pollutants on aquatic and terrestrial ecosystems.

This unit builds on:

- Science 10, Unit A: Energy and Matter in Chemical Change
- Science 20, Unit A: Chemical Changes

Unit B will require approximately 25% of the time allotted for Science 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit B but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• nonlinear equations	Pure Mathematics 10, specific outcomes 3.1 and 4.2; Pure Mathematics 20, specific outcome 3.1; Pure Mathematics 30, specific outcome 2.4; Applied Mathematics 10, specific outcomes 3.1, 3.2, 3.3 and 5.1; Applied Mathematics 20, specific outcomes 2.1, 2.3 and 2.4
• measurement	Applied Mathematics 20, specific outcomes 6.2, 6.3 and 6.4

Focusing Questions: What are some of the important effects of acids, bases and synthetic organic compounds on the environment and living systems? What are the chemical principles and perspectives involved in the assessment of the technologies designed to reduce the production and emission of these compounds into the environment? How does society look beyond a technological fix in deciding how to best meet human needs while sustaining the environment?

General Outcomes: There are three major outcomes in this unit.

Students will:

1. analyze the sources of acids and bases and their effects on the environment
2. analyze the sources of organic compounds and their effects on the environment
3. analyze, from a variety of perspectives, the risks and benefits of using chemical processes in meeting human needs and assess technologies for reducing the impact of chemical compounds on the environment.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the learning outcomes.

- acids and bases
- pH and hydronium ion concentration
- stoichiometry and titration of strong monoprotic acids and strong monoprotic bases
- buffers and buffering capacity
- sources and environmental impact of SO_x, NO_x, acid deposition and photochemical smog
- sources, uses and environmental effects of organic compounds
- biomagnification and persistence of pollutants

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General Outcome 1
Students will analyze the sources of acids and bases and their effects on the environment.

Specific Outcomes for Knowledge

Students will:

30–B1.1k define acids and bases in terms of proton donors and proton acceptors

30–B1.2k differentiate among acids, bases, neutral ionic compounds, neutral molecular compounds and strong and weak acids, based on appropriate diagnostic tests

30–B1.3k describe the relationship between pH and hydronium ion concentration

30–B1.4k explain, qualitatively, how buffers maintain a relatively constant pH when a small amount of acid or base is added to an aqueous system

30–B1.5k explain the importance of maintaining a relatively constant pH in a living system; *e.g., the role of the hydrogen carbonate ion in maintaining the pH of blood, the evolution of the Arctic herb Artemisia tilesii in resisting acidic moisture by extracting calcium from the soil and pumping the calcium to its leaves*

30–B1.6k trace the historical use of acid-base indicators; *e.g., early Aboriginal methods of using extracts from natural substances*

30–B1.7k explain what is meant by buffering capacity; *e.g., soil or bedrock*

30–B1.8k outline the chemical reactions (*e.g., combustion reactions*) that produce air pollutants (i.e., sulfur dioxide and nitrous oxides) that, when combined with water, ultimately result in acid deposition

30–B1.9k describe impacts on the biotic and abiotic components of the environment caused by acid deposition; *e.g., lowered pH in water systems, accelerated corrosion, metal leaching from bedrock, the impact of leached metals on plants and the food chain.*

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–B1.1sts demonstrate an understanding that science and technology developed to meet societal needs and expand human capacity **(SEC1) [ICT F2–4.4, F2–4.8]**

- describe, in general terms, the uses of acids and bases in industry; *e.g., hydrochloric acid used to extract metals from ores; sulfuric acid used to make fertilizers, paints, plastics, dyes and detergents; and sodium hydroxide used to make soaps and drain and oven cleaners*

30–B1.2sts explain how science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F3–4.1]**

- identify and explain how human activities and natural events contribute to acid deposition in the environment.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will analyze the sources of acids and bases and their effects on the environment.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–B1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues
- design a procedure to identify acidic, basic, neutral ionic and molecular solutions **(IP–ST3) [ICT C6–4.1, C6–4.4]**
- design an experiment for determining the buffering capacity of local soil or pond samples **(IP–NS4) [ICT F1–4.2]**.

Performing and Recording

Students will:

30–B1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information
- use a pH meter and/or pH paper and indicators to measure the pH of solutions; *e.g., collect pH data to study an aquatic ecosystem* **(PR–NS2) [ICT C6–4.4]**
- use indicators and a conductivity meter to differentiate between a strong acid and a weak acid **(PR–NS3, PR–NS5) [ICT C6–4.4]**
- perform a titration using a strong monoprotic acid and a strong monoprotic base **(PR–NS2) [ICT C6–4.4]**
- *use computer-based probes and/or a graphing calculator to measure the pH of water and/or aqueous solutions* **(PR–NS2) [ICT C6–4.4, P2–4.1]**.

Analyzing and Interpreting

Students will:

30–B1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions
- use titration data to determine the concentration of a strong acid or a strong base **(PR–NS2, PR–NS3) [ICT C6–4.2]**
- research and plot on a map the distribution patterns of acid deposition as influenced by prevailing winds **(A1–ST4) [ICT C6–4.3]**
- calculate pH from hydronium ion concentration and hydronium ion concentration from pH **(AI–NS3)**
- calculate the concentration of strong monoprotic acids and strong monoprotic bases from empirical data **(AI–NS3)**.

Communication and Teamwork

Students will:

30–B1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results
- compare collected titration data with that of other individuals and groups **(CT–NS3)**
- use appropriate scientific conventions when communicating solutions to titration problems **(CT–ST2) [ICT F1–4.3]**
- *research protocols for transporting acidic and caustic materials through populated areas* **(CT–SEC4)**
- *prepare a group visual display explaining initiatives taken by industry to reduce emissions that can cause acid deposition* **(CT–SEC2) [ICT C1–4.4, P4–4.2]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will analyze the sources of organic compounds and their effects on the environment.

Specific Outcomes for Knowledge

Students will:

30–B2.1k identify and name carbon compounds, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature that contain up to three carbon atoms in the parent chain and a single occurrence of one type of functional group, including simple halogenated hydrocarbons *(e.g., 2-chloropropane)*, alcohols *(e.g., propan-1-ol)*, carboxylic acids *(e.g., propanoic acid)* and esters *(e.g., methyl propanoate)*

30–B2.2k describe the common uses of hydrocarbons, including simple halogenated hydrocarbons, alcohols, carboxylic acids and esters; *e.g., chlorofluorocarbons (CFCs) as refrigerants, as propellants and in the manufacture of plastic foam products; ethanol as a solvent and as a gasoline additive; ethanoic acid as vinegar; ethyl ethanoate as nail-polish remover*

30–B2.3k identify organic compounds commonly considered to be environmental pollutants; i.e., hydrocarbons, organic waste, CFCs, polychlorinated biphenyls (PCBs), dioxins and furans

30–B2.4k list the sources of, and analyze the hazards posed by, halogenated hydrocarbons and benzene derivatives

30–B2.5k identify and explain how human activities and natural events contribute to the production of photochemical smog, the depletion of the ozone layer and increased concentrations of organic compounds in the environment; *e.g., driving a car, use of CFCs, agricultural practices*

30–B2.6k explain the mechanism and significance of biomagnification.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–B2.1sts explain how science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F2–4.8, F3–4.1]**

- explain how the introduction of environmental contaminants, i.e., herbicides, pesticides, dichlorodiphenyltrichloroethane (DDT), CFCs, $SO_2(g)$, $CO_2(g)$, particularly persistent organic pollutants (POPs), affects living systems globally
- interpret information describing biomagnification and environmental persistence of organic pollutants on biological systems; *e.g., lethal dose (LD, LD 50), PCBs, DDT.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will analyze the sources of organic compounds and their effects on the environment.

Specific Outcomes for Skills (Social and Environmental Emphasis)

Initiating and Planning

Students will:

30–B2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design an investigation of alternatives to the use of pesticides or herbicides* **(IP–ST2) [ICT C2–4.1]**
- *predict the impact of synthetic organic compounds on a local aquatic or terrestrial ecosystem* **(IP–NS3)**.

Performing and Recording

Students will:

30–B2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *search and record initiatives designed to reduce the impact of halogenated hydrocarbons on the environment* **(PR–SEC1)**
- *investigate the action of a pesticide or herbicide, considering toxicity, volatility, target specificity and resistance development* **(PR–SEC1)**
- *prepare a synthetic organic compound (e.g., an alcohol, an ester or a soap) and investigate its properties* **(PR–NS3)**.

Analyzing and Interpreting

Students will:

30–B2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- use current reliable information sources to analyze technologies used to reduce the release of POPs into the environment **(A1–ST4) [ICT C7–4.2]**.

Communication and Teamwork

Students will:

30–B2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *develop a plan to study the impact of organic compounds on an aquatic or a terrestrial ecosystem and make revisions, based on group feedback, before implementing the plan* **(CT–SEC1, CT–SEC4)**.

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General Outcome 3
Students will analyze, from a variety of perspectives, the risks and benefits of using chemical processes in meeting human needs and assess technologies for reducing the impact of chemical compounds on the environment.

Specific Outcomes for Knowledge

Students will:

30–B3.1k describe the risks and benefits of using chemical processes that may produce products and/or by-products that have the potential to harm the environment

30–B3.2k describe technologies used to reduce the production and emission of chemical compounds that have the potential to harm the environment; *e.g., activities related to internal combustion engines, smelting, pesticide production, sweetening of sour gas*

30–B3.3k describe alternatives to the use of chemical technologies; *e.g., bioremediation for contaminated soil, biological controls for pests, biodegradable products.*

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

30–B3.1sts explain how science and technology have both intended and unintended consequences for humans and the environment **(SEC3) [ICT F2–4.8, F3–4.1]**

- explain the role of concentration in a risk-benefit analysis for determining the safe limits of particular substances; *e.g., pesticide residues, chlorinated or fluorinated compounds*

30–B3.2sts explain that the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7) [ICT F2–4.2, F3–4.1]**

- *explain the meaning of technological fix and explain the need for broader considerations in reducing the environmental impact of the by-products of chemical processes.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will analyze, from a variety of perspectives, the risks and benefits of using chemical processes in meeting human needs and assess technologies for reducing the impact of chemical compounds on the environment.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

30–B3.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- plan an evaluation, including a risk-benefit analysis, of a chemical process or an issue related to its use **(IP–SEC2) [ICT F3–4.1]**
- describe procedures for the safe handling, storage and disposal of materials used in the laboratory, with references to WHMIS and consumer product labelling information **(IP–SEC3) [ICT F5–4.2]**
- *hypothesize about seasonal variations in water quality in the community* **(IP–NS3) [ICT C7–4.2]**.

Performing and Recording

Students will:

30–B3.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- debate the issue of whether protecting the environment should have priority over economic interests **(PR–SEC1) [ICT C1–4.4, C2–4.2]**
- collect information from a wide selection of resources relating to a chemical process or an issue related to its use **(PR–SEC1) [ICT F3–4.1]**

Analyzing and Interpreting

Students will:

30–B3.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- interpret data from water quality tests, such as pH, BOD, dissolved oxygen and organic compounds
- analyze alternatives to the use of chemical technologies; *e.g., bioremediation for contaminated soil, biological controls for pests, biodegradable products* **(AI–SEC2)**
- evaluate methods used to reduce the incidence of acid deposition and photochemical smog; *e.g., reducing sulfur content in fuels, using catalytic converters in automobiles, smokestack scrubbers* **(AI–SEC2)**
- *present statistical data in diagrams, tables and graphs as part of a briefing for a public hearing on a proposed chemical industry in an ecologically sensitive area* **(AI–ST1) [ICT P2–4.1, P4–4.3, P6–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 3
Students will analyze, from a variety of perspectives, the risks and benefits of using chemical processes in meeting human needs and assess technologies for reducing the impact of chemical compounds on the environment.

Communication and Teamwork

Students will:

30–B3.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- consult and evaluate a wide variety of sources that reflect varied viewpoints on the risks and benefits of using particular chemicals; *e.g., the use of DDT in countries where malaria is a major cause of death* **(CT–SEC1) [ICT C2–4.1, C2–4.2]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit C: Electromagnetic Energy

Themes: Diversity and Energy

Overview: Electrical energy transmission and transformation technologies, based on field theory and on an understanding of electromagnetic radiation (EMR), play an important role in meeting human needs. These technologies are also useful in furthering our understanding of the universe. In this unit, students investigate the functioning of these technologies, the principles of field theory and the properties of EMR. This unit provides a foundation for further studies of electromagnetism.

This unit builds on:
- Science 9, Unit D: Electrical Principles and Technologies
- Science 10, Unit D: Energy Flow in Global Systems
- Science 20, Unit B: Changes in Motion

Unit B will require approximately 25% of the time allotted for Science 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit C but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• properties of linear functions	Pure Mathematics 10, specific outcome 4.6; Applied Mathematics 10 specific outcomes 5.2 and 5.7
• formula manipulation	Pure Mathematics 10, specific outcome 4.4; Applied Mathematics 10 specific outcome 5.1
• nonlinear equations	Pure Mathematics 20, specific outcome 3.1; Applied Mathematics 20, specific outcome 2.1

Focusing Questions: How can field theory be used to explain the function of electrical devices in the home and in the workplace? How are the specific properties of the electromagnetic spectrum applied to medical, communication and remote-sensing technologies? How do imaging technologies reveal the structure and the history, and shape our understanding, of the universe?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explain field theory and analyze its applications in technologies used to produce, transmit and transform electrical energy
2. describe the properties of the electromagnetic spectrum and their applications in medical technologies, communication systems and remote-sensing technologies used to study the universe.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the learning outcomes.
- devices based on electric and magnetic fields (electric motors, generators and transformers)
- the electromagnetic spectrum, its properties and its effects on living tissue
- basic properties of field theory for the comparison of gravitational, electric and magnetic fields
- principles of field theory and applications in technology
- technologies used to study the structure and history of the universe
- circuitry

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General Outcome 1
Students will explain field theory and analyze its applications in technologies used to produce, transmit and transform electrical energy.

Specific Outcomes for Knowledge

Students will:

30–C1.1k define a field as a property of space around a mass, an electric charge or a magnet that causes another mass, electric charge or magnet introduced in to this region to experience a force

30–C1.2k compare the interaction between static electric charges with the interaction between magnetic poles and with the interaction between two masses at a distance

30–C1.3k compare the basic properties (source, direction and strength) of vector fields (gravitational, electric and magnetic), as determined by a test object

30–C1.4k describe gravitational and electric field strength at a given distance from a mass or a point charge, using the equations $\left|\vec{g}\right| = Gm / r^2$ and $\left|\vec{E}\right| = kq / r^2$

30–C1.5k describe the effect of a conductor moving through a magnetic field and inducing an electrical current

30–C1.6k describe the relationships, for up to three resistors, among power, current, voltage and resistance for series and parallel circuits, using the equations $V = IR$, $P = VI$, $P = I^2R$, $R_T = R_1 + R_2 + R_3$, and $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

30–C1.7k describe electrical energy in kilowatt hours and joules, using the equation $E_e = Pt$ for electrical energy and the equation $P = VI$ for power

30–C1.8k distinguish between alternating current (AC) and direct current (DC) in terms of electron flow and electric field

30–C1.9k describe the operation of a transformer, in terms of the relationship among current, voltage and the number of turns in the primary and secondary coils, using the equation $N_p / N_s = V_p / V_s = I_s / I_p$

30–C1.10k describe the advantage of AC over DC for transmitting and using electrical energy

30–C1.11k compare the general design and function of a DC electric motor and a generator

30–C1.12k describe, in terms of design and electrical energy, the functioning of safety technologies; *e.g., circuit fuses and breakers, polarized plugs and ground wiring.*

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

30–C1.1sts explain that the goal of technologies, based on the application of field theory, is to provide solutions to practical problems **(ST1) [ICT F2–4.4, F2–4.8]**

- describe, in general terms, examples of technological devices based on electrical current and describe their impact on daily life; *e.g., light bulbs, electrical devices and electromagnets in the home, the workplace and in industry*
- describe, in general terms, examples of technological devices based on electric and magnetic fields and describe their impact on daily life; *e.g., telephones, cellular telephones, CD players, photocopiers, electrostatic filters and scrubbers*

30–C1.2sts explain that technological development may involve the creation of prototypes, the testing of prototypes and the application of knowledge from related and interdisciplinary fields **(ST2) [ICT C6–4.5, F2–4.8]**

- *explain the significance of a simple electric generator or motor in society*
- *investigate the use of nanotubes in the production of wires to transmit electricity.*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain field theory and analyze its applications in technologies used to produce, transmit and transform electrical energy.

Specific Outcomes for Skills (Nature of Science Emphasis)

Initiating and Planning

Students will:

30–C1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- evaluate and select appropriate instruments for measuring current, voltage and resistance **(IP–ST3) [ICT C6–4.4, C6–4.5, F1–4.2]**
- design an experiment and identify specific variables to measure current, voltage and resistance **(PR–NS4) [ICT C6–4.1]**.

Performing and Recording

Students will:

30–C1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- investigate the interactions between static electric charges, between magnetic poles and between two masses **(PR–NS3)**
- construct an electric circuit to measure current, voltage and resistance, using a voltmeter or an ammeter **(PR–NS3) [ICT F1–4.2]**
- construct a simple electric generator or a DC motor **(PR–ST2)**
- draw diagrams to represent fields (*e.g., gravitational, electric or magnetic fields*), using field lines **(PR–NS4)**
- *investigate the effects of a conductor moving through a magnetic field by manipulating variables such as current, velocity and magnetic field strength* **(PR–NS2, PR–NS3)**.

Analyzing and Interpreting

Students will:

30–C1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- test and evaluate a self-constructed, simple electric generator or motor in terms of design, ruggedness and ability to perform a specific function **(AI–ST1)**
- calculate the values for $|\vec{g}|$ and $|\vec{E}|$, using the corresponding field-strength equations **(AI–ST3) [ICT C6–4.1]**
- calculate the resistance of series and parallel circuits for a maximum of three resistors **(AI–ST3) [ICT C6–4.1]**
- calculate values for power, current, voltage and resistance **(AI–ST3) [ICT C6–4.1]**
- calculate the value of E_e, P, t, I, V, using the related equations **(AI–ST3) [ICT C6–4.1]**
- calculate current voltage and the number of turns in the primary and secondary coils of electrical transformers **(AI–ST3) [ICT C6–4.1]**.

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General Outcome 1
Students will explain field theory and analyze its applications in technologies used to produce, transmit and transform electrical energy.

Communication and Teamwork

Students will:

30–C1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *work cooperatively in designing and constructing a simple electric generator or motor and troubleshoot problems as they arise* **(CT–ST1)**
- *present research and defend a position, using multimedia capabilities, on the effect of high-voltage power lines in their community* **(CT–ST2) [ICT C1–4.4, C7–4.3, P3–4.1, P6–4.1]**.

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General Outcome 2
Students will describe the properties of the electromagnetic spectrum and their applications in medical technologies, communication systems and remote-sensing technologies used to study the universe.

Specific Outcomes for Knowledge

Students will:

30–C2.1k describe the range of the electromagnetic spectrum from long, low-frequency radio waves through microwaves, infrared (IR) rays, visible light rays and ultraviolet (UV) radiation to very short, high-frequency waves, such as X-rays and gamma rays

30–C2.2k compare and contrast, to each other, the various constituents of the electromagnetic spectrum, on the basis of source, frequency, wavelength and energy, and their effect on living tissue; *e.g., UV radiation on human skin and photosynthetic organisms; gamma radiation on living cells; visible light on plants, phytoplankton and humans; artificial illumination on the growth of plants*

30–C2.3k recognize that Earth's atmosphere absorbs certain frequencies of EMR

30–C2.4k investigate and describe, qualitatively, the phenomena of reflection, refraction, diffraction and polarization of visible light

30–C2.5k compare and contrast the properties of radiation, from any region of the electromagnetic spectrum, with those of visible light; i.e., wavelength, frequency, speed, reflection, refraction, diffraction, penetrability

30–C2.6k investigate and describe the relationships of the variables in the universal wave equation $v = \lambda f$

30–C2.7k explain, in general terms, the design of telescopes that are used to gather information about the universe through the collection of as much EMR as possible; i.e., reflecting and refracting optical and radio telescopes

30–C2.8k explain that nuclear fusion in the sun, represented by the equation ${}^{2}_{1}\mathrm{H} + {}^{2}_{1}\mathrm{H} \rightarrow {}^{3}_{2}\mathrm{He} + {}^{1}_{0}\mathrm{n}$, produces a wide spectrum of EMR

30–C2.9k describe, in general terms, how a spectroscope can be used to determine the composition of incandescent objects or substances, and the conditions necessary to produce emission (bright line) and absorption (dark line) spectra, in terms of light source and temperature

30–C2.10k describe technologies used to study stars

- spectroscopes used to analyze the distribution of energy in a star's continuous emission spectrum can be used to estimate the surface temperature of the star
- Doppler-shift technology used to measure the speed of distant stars provides evidence that the universe is expanding

30-C2.11k describe, in general terms, the evolution of stars and the existence of black holes, white dwarves and neutron stars.

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General Outcome 2
Students will describe the properties of the electromagnetic spectrum and their applications in medical technologies, communication systems and remote-sensing technologies used to study the universe.

Specific Outcomes for Science, Technology and Society (STS) (Science and Technology Emphasis)

Students will:

30–C2.1sts explain that the goal of technology is to provide solutions to practical problems **(ST1)** **[ICT F2–4.4]**

- identify examples of technologies that apply EMR to solve medical, communication, industrial and environmental problems; *e.g., use of UV radiation to kill bacteria; diagnostic use of MRIs and X-rays; use of radio waves, microwaves, fibre optics and infrared light in communications; use of remote-sensing technologies, including telescopes, space probes and satellites, in the study of the universe*
- *describe how lenses and/or laser surgery are used to correct vision problems*
- *describe technologies developed to protect astronauts from high-energy radiation*

30–C2.2sts explain that scientific knowledge may lead to the development of new technologies, and new technologies may lead to or facilitate scientific discovery **(ST4)** **[ICT F2–4.4, F2–4.8]**

- explain, in general terms, how EMR-detection technologies have advanced scientific knowledge of our universe and the structure of matter

30–C2.3sts explain how the appropriateness, risks and benefits of technologies need to be assessed for each potential application from a variety of perspectives, including sustainability **(ST7)** **[ICT F2–4.2, F3–4.1]**

- *assess the value to society of studying the structure and the history of the universe and the expense of building telescopes, such as the Hubble, or launching space probes*
- *conduct a risk-benefit analysis regarding the use of radiation treatment for cancer or the frequency of use of EMR in medical diagnostics.*

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General Outcome 2
Students will describe the properties of the electromagnetic spectrum and their applications in medical technologies, communication systems and remote-sensing technologies used to study the universe.

Specific Outcomes for Skills (Science and Technology Emphasis)

Initiating and Planning

Students will:

30–C2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- design an experiment, identifying specific variables, to investigate the reflection, refraction or polarization of visible light **(IP–NS2)**
- calculate values for any of the variables in the universal wave equation **(AI–NS3)**
- *define a question regarding the frequency and duration of exposure to EMR from use of video terminals, cellular telephones and other devices* **(IP–ST1)**
- *state the qualitative relationship among optical density (refractive index), angle of incidence and total internal reflection* **(IP–NS3)**
- *evaluate and select appropriate instruments, such as a prism, a diffraction grating, a light meter or a spectroscope, for problem solving and inquiry* **(IP–ST3)** **[ICT C6–4.5]**.

Performing and Recording

Students will:

30–C2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- investigate the reflection, refraction or polarization of visible light **(PR–NS3)**
- create data tables from investigations into polarization, reflection or refraction of visible light or draw diagrams to illustrate these phenomena **(PR–NS4)**
- create a summary table or a diagram of spectral lines observed from gas discharge tubes **(PR–NS4)** **[ICT P2–4.1]**
- *record observations of the colour changes of an incandescent object, such as a light bulb, as temperature is changed* **(PR–NS3)**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe the properties of the electromagnetic spectrum and their applications in medical technologies, communication systems and remote-sensing technologies used to study the universe.

Analyzing and Interpreting

Students will:

30–C2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- observe and analyze the various spectra of an artificial light source, using a spectroscope, prism or diffraction grating **(AI–NS2)**
- *assess the bias, reliability and validity of electronically accessed information on exposure to EMR emitted by video terminals, cellular telephones and other devices* **(AI–NS4) [ICT C2–4.2, C3–4.1, C3–4.2]**
- *propose solutions to reduce human exposure to EMR, emitted by such devices as radio telephones, laptop computers and video terminals, and identify the strengths and weaknesses of each solution* **(AI–ST2)**
- *pose new questions, such as "What is the relationship between the polarization of light and the ability of insects to use this property to navigate?" or "How are emission and absorption spectra used in determining the spectral classification of stars?"* **(AI–ST4).**

Communication and Teamwork

Students will:

30–C2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *present multiple perspectives on the value of studying the structure and history of the universe and the expense of building telescopes or launching space probes* **(CT–ST2) [ICT C1–4.4, P6–4.1]**
- *use appropriate communication technology to elicit information on recent advances in the study of the universe* **(CT–NS1) [ICT C5–4.1]**
- *participate in a variety of electronic group formats when developing criteria to assess telescopes designed to study the universe* **(CT–ST3) [ICT C5–4.2]**
- *select and use multimedia capabilities for presenting research on the effect of locating a communications tower in a community* **(CT–ST2) [ICT C1–4.4, C7–4.3, P3–4.1, P6–4.1]**
- *take and defend a position in support for or against the location of a communications tower in their local community* **(CT–ST3) [ICT C1–4.4].**

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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Unit D: Energy and the Environment

Themes: Energy and Systems

Overview: Sustainable development requires balancing global energy demands with maintaining a viable biosphere. Students investigate and analyze the sources of renewable and nonrenewable energy and, in doing so, explore the need for multiple perspectives and the need to develop energy-efficient technologies. This unit provides an opportunity for students to address the demand for environmentally sustainable solutions to meet global energy needs.

This unit builds on:

- Science 10, Unit D: Energy Flow in Global Systems
- Science 20, Unit A: Chemical Changes, Unit B: Changes in Motion, Unit C: The Changing Earth and Unit D: Changes in Living Systems

Unit D will require approximately 25% of the time allotted for Science 30.

Links to Mathematics: The following mathematics topics are related to the content of Unit D but are not considered prerequisites.

Topics:	These topics may be found in the following courses:
• properties of linear functions	Pure Mathematics 10, specific outcome 4.6; Applied Mathematics 10, specific outcomes 5.1, 5.2 and 5.7
• graphing quadratic functions	Pure Mathematics 20, specific outcomes 2.3 and 2.4; Applied Mathematics 20, specific outcomes 2.1 and 2.3

Focusing Questions: How can Canadians and other members of the international community conserve energy and maintain quality of life? What are the benefits and costs of available nonrenewable energy sources and of developing renewable energy sources? What is our energy future?

General Outcomes: There are two major outcomes in this unit.

Students will:

1. explain the need for balancing the growth in global energy demands with maintaining a viable biosphere
2. describe the sun as Earth's main source of energy and explain the functioning of some conventional and alternative technologies that convert solar, nuclear, tidal and other energy sources into useable forms.

Key Concepts: The following concepts are developed in this unit and may also be addressed in other units or in other courses. The intended level and scope of treatment is defined by the learning outcomes.

- global energy consumption and its impact on the biosphere
- sources of renewable energy
- balancing energy use with sustainable development
- conversion of solar energy, fossil fuels and wind and water power into thermal and electrical energy
- fission and fusion, nuclear change
- heats of formation and Hess's law
- nuclear, wind, hydro, biomass, tidal, solar, fuel cell and geothermal alternative energy technologies

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General Outcome 1
Students will explain the need for balancing the growth in global energy demands with maintaining a viable biosphere.

Specific Outcomes for Knowledge

Students will:

30–D1.1k compare the energy consumption of contemporary society with that of traditional cultures and precontact Aboriginal societies, and investigate and analyze the exponential growth of global energy consumption in recent history

30–D1.2k compare Canada's per-capita energy consumption with developed and developing countries and identify factors that affect consumption; *e.g., economy, lifestyle, level of technology, geography, climate*

30–D1.3k apply the concept of sustainable development to increasing the efficient use of energy; *e.g., efficient use of energy in the home, in industry and in transportation*

30–D1.4k explain the need to develop technologies that use renewable and nonrenewable energy sources to meet the increasing global demand

30–D1.5k describe the environmental impact of developing and using various energy sources; i.e., conventional oil, oil sands, solar power, wind power, biomass, hydroelectricity, coal-burning power, nuclear power, geothermal

30–D1.6k describe how the Aboriginal perspective of an interconnected environment demonstrates the need to balance resource extraction with environmental impact.

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–D1.1sts explain that science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.4, F2–4.8]**

- investigate and assess the need for strategies (*e.g., co-generation, waste-energy recovery, electrical load scheduling)* and policies to increase energy efficiency as a means of balancing global energy demands with maintaining a viable biosphere.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 1
Students will explain the need for balancing the growth in global energy demands with maintaining a viable biosphere.

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

30–D1.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- identify questions to investigate that arise from science- and technology-related issues; *e.g., "Which energy sources and technologies best balance the need for global energy demand with acceptable environmental impacts?"* **(IP–SEC1) [ICT F2–4.8]**
- *predict the time frame by which world oil reserves may reach near-depletion levels, based on the current rates of consumption and estimates of resources* **(IP–NS3) [ICT C7–4.2]**.

Performing and Recording

Students will:

30–D1.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *research current information relevant to global oil and gas reserves or sustainable development initiatives* **(PR–SEC1) [ICT C2–4.1, F2–4.7]**
- *compile and organize findings as part of a briefing for a public hearing on an issue such as the proposed development of an energy source in an ecologically sensitive area* **(PR–NS4) [ICT C6–4.2, P2–4.1]**.

Analyzing and Interpreting

Students will:

30–D1.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- analyze data charts, tables and graphs on global energy consumption in the past, in the present and predicted for the future **[ICT C7–4.2]**
- *evaluate the bias, reliability and validity of electronically accessed information on alternative and renewable energy sources* **(AI–SEC1) [ICT C2–4.2, C3–4.1, C3–4.2]**
- *identify new questions, such as those that relate to humanity's global energy future or those that relate to energy consumption by various sectors, such as metallurgy, petrochemical, pulp and paper, transportation* **(AI–SEC4)**
- *assess policies intended to facilitate efficient use of energy and reliance on renewable energy sources* **(AI–SEC2)**.

Communication and Teamwork

Students will:

30–D1.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *present a visual display of initiatives taken by industry to protect the environment* **(CT–SEC2) [ICT C1–4.4, P6–4.1]**
- *develop and present an energy policy, based upon a set of criteria, in relation to a possible energy crisis in Canada* **(CT–SEC3)**

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe the sun as Earth's main source of energy and explain the functioning of some conventional and alternative technologies that convert solar, nuclear, tidal and other energy sources into useable forms.

Specific Outcomes for Knowledge

Students will:

30–D2.1k explain how Hess's Law, $\Delta H^\circ = \sum \Delta_f H^\circ$ (products) $- \sum \Delta_f H^\circ$ (reactants), leads to prediction of heats of combustion

30–D2.2k contrast the proportion of solar energy that creates wind and drives the water cycle with the small proportion captured by photosynthesis as chemical potential energy

30–D2.3k describe the conversion of solar energy into renewable forms (e.g., wind, hydropower, chemical potential energy by photosynthesis) and nonrenewable forms (e.g., coal, oil and gas) and further conversion into electrical and thermal energy

30–D2.4k describe the functioning of renewable energy technologies and assess their advantages and disadvantages, including active and passive solar-heating technologies, wind turbines, hydroelectric power, biomass energy, geothermal energy, hydrogen fuel cells

30–D2.5k explain the difference between fission and fusion and balance simple nuclear reaction equations to show the conservation of nucleons; *e.g.*,
$^{1}_{0}n + {}^{235}_{92}U \rightarrow {}^{141}_{56}Ba + {}^{92}_{36}Kr + 3\,{}^{1}_{0}n$; $^{2}_{1}H + {}^{2}_{1}H \rightarrow {}^{3}_{2}He + {}^{1}_{0}n$

30–D2.6k describe the main types and sources of radioactive decay and resulting ionizing radiation; i.e., alpha (α), beta (β) and gamma (γ) decay

30–D2.7k describe mass-energy changes in fission and fusion reactions, as represented by the formula $E = mc^2$

30–D2.8k describe, in general terms, the operation of a fission reactor (*e.g., the Canadian Deuterium Uranium [CANDU] Reactor*) and the current state of fusion research

30–D2.9k trace the relationship between nuclear energy and geothermal energy

30–D2.10k compare and contrast conventional coal, oil-fired or hydroelectric power stations with nuclear power stations, in terms of purpose, process of energy conversions, design and function

30–D2.11k contrast, quantitatively, the orders of magnitude of energy produced by nuclear, chemical and phase changes

30–D2.12k explain the source of tides, in terms of gravitational attraction and the relative motions of the sun, moon and Earth

30–D2.13k describe the energy transformations involved in converting tidal energy to electrical energy and compare tidal power to hydroelectric power; *e.g., tidal generating stations at the Bay of Fundy, Canada and La Rance, France.*

Specific Outcomes for Science, Technology and Society (STS) (Social and Environmental Contexts Emphasis)

Students will:

30–D2.1sts explain that decisions regarding the application of scientific and technological development involve a variety of perspectives, including social, cultural, environmental, ethical and economic considerations **(SEC4b) [ICT F2–4.2, F3–4.1]**

- evaluate the environmental and economic implications of energy transformation technologies; *e.g., nuclear, geothermal, fossil fuel, hydroelectric, wind, tidal power or hydrogen-cell power in a risk-benefit analysis*

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe the sun as Earth's main source of energy and explain the functioning of some conventional and alternative technologies that convert solar, nuclear, tidal and other energy sources into useable forms.

30–D2.2sts explain that science and technology are developed to meet societal needs and expand human capability **(SEC1) [ICT F2–4.4, F2–4.8]**

- *determine how the allocation of funds for research into the development of new energy conversion devices and sources balances the needs of society with preservation of the environment.*

Specific Outcomes for Skills (Social and Environmental Contexts Emphasis)

Initiating and Planning

Students will:

30–D2.1s formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues

- *design an experiment and identify specific variables to compare the heat produced by various fuels* **(IP–NS2) [ICT C6–4.2]**.

Performing and Recording

Students will:

30–D2.2s conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information

- *research, integrate and synthesize information from various print and electronic sources on sustainable development initiatives, such as fuel cells* **(PR–SEC1) [ICT C1–4.1, C2–4.1, C3–4.1, C3–4.2]**.

Analyzing and Interpreting

Students will:

30–D2.3s analyze data and apply mathematical and conceptual models to develop and assess possible solutions

- calculate heats of combustion using Hess's Law; *e.g., calculate and compare fuels currently used with those used in the past* **(AI–NS3) [ICT C6–4.1]**
- calculate mass-energy changes in fission and fusion reactions, using the equation $E = mc^2$ **(AI–NS3) [ICT C6–4.1]**
- investigate, quantitatively, the efficiency of a device, using energy input and energy output data; *e.g., solar collector, photovoltaic cell, fossil fuel or biomass burner, biogas generator* **(AI–ST1)**
- *identify new questions, such as those that relate to nuclear fusion becoming a global source of energy* **(AI–SEC4)**
- *assess risks and benefits of scientific and technological developments, such as cogeneration, hybrid vehicles, fuel efficiency, waste-energy recovery, electrical load scheduling* **(AI–SEC2) [ICT F3–4.1]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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General Outcome 2
Students will describe the sun as Earth's main source of energy and explain the functioning of some conventional and alternative technologies that convert solar, nuclear, tidal and other energy sources into useable forms.

Communication and Teamwork

Students will:

30–D2.4s work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results

- *use advanced menu features within word processing software to insert tables and energy budgets for a risk-benefit analysis of an energy transformation technology* **(CT–ST2) [ICT P4–4.3]**
- *consult a wide variety of sources to evaluate varied perspectives on topics such as cogeneration, fuel efficiency, waste-energy recovery, electrical load scheduling and policies that facilitate energy efficiency and increase reliance on renewable energy sources* **(CT–SEC1) [ICT C2–4.1, C2–4.2]**.

Note: Some of the outcomes are supported by examples. The examples are written in italics and **do not form part of the required program** but are provided as an illustration of how the outcomes might be developed.

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SECOND LANGUAGES

CONTENTS

Chinese Language and Culture 10-3Y, 20-3Y, 30-3Y

Chinese Language and Culture 10-6Y, 20-6Y, 30-6Y

French as a Second Language (ECS to Grade 12)

German Language and Culture 10-3Y, 20-3Y, 30-3Y

German Language and Culture 10-6Y, 20-6Y, 30-6Y

Italian Language and Culture 10-3Y, 20-3Y, 30-3Y

Italian Language and Culture 10-6Y, 20-6Y, 30-6Y

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Ukrainian Language and Culture 10-6Y, 20-6Y, 30-6Y

GERMAN LANGUAGE AND CULTURE 10-3Y, 20-3Y, 30-3Y

This German Language and Culture Three-year (3Y) Program is intended for students who are beginning their study of German language and culture in senior high school.

INTRODUCTION

Studying the German language opens the door to understanding and participating in an influential world culture with close relationships to both the English language and our contemporary way of life.

Communication with people living in much of northern and central Europe is possible for those who know the German language. Approximately 120 million people speak German; it is the official language of Austria and Germany, and it is one of several official languages in Liechtenstein, Luxembourg and Switzerland. In Belgium and Denmark, German is a language with special status.

German can be an important key to communication in many parts of the world beyond the German-speaking nations as well. In eastern Europe, for example, the use of German as a major language of business has been increasing in recent years. According to Canada's 2001 Census, German is Canada's fifth most common mother tongue. In Alberta, about 78 000 people reported German as their mother tongue in that same year.

Learning German as another language is to embark on a profound experience of cross-cultural exploration. Contributions from German culture have shaped such areas as science, technology, music, religion and politics, to name but a few. Over the centuries, German has had significant impact, in both positive and negative ways, far beyond the borders of nations where the language is spoken.

For those students who already have some knowledge of German, or a family connection to the culture, there is the opportunity to renew contact with their ancestral language and culture or to maintain and develop literacy in a first language that is not the majority language in the community.

The value, for Canadian society as a whole, of learning German can be summarized as follows. Learning German leads to:

- an increased awareness of, and sensitivity to, cultural and linguistic diversity
- an enhanced role in the international community
- improved potential in the Canadian and the global marketplace and workplace.

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There are also many personal reasons for learning German. Students who have no previous knowledge of the language can look forward to:

- more opportunity to communicate directly with German-speaking people and gain a deeper insight into their own culture and language
- a broader range of educational, career and leisure opportunities
- the opportunity to meet the entrance requirements of many post-secondary institutions in Alberta and across Canada.

Students receive additional, indirect benefits from learning German as another language, including:

- development of increased competence in their use of English or in other languages they may know
- enhanced cognitive functioning, particularly an increased ability to conceptualize and to think abstractly; more cognitive flexibility; and greater divergent thinking, creativity and metalinguistic competence.

ASSUMPTIONS

The following statements are assumptions that have guided the development process of this program of studies.

- Language is communication.
- Language is culture.
- All students can be successful learners of language and culture, although they will learn in a variety of ways and acquire proficiency at varied rates.
- All languages can be taught and learned.
- Learning German as another language leads to enhanced learning in both the student's primary language and in related areas of cognitive development and knowledge acquisition. This is true of students who come to the class with some background knowledge of German and develop literacy skills in the language. It is also true for students who have no cultural or linguistic background in German and are studying German as a second language.

THE CONCEPTUAL MODEL

The aim of this program of studies is the development of communicative competence in the German language.

Four Components

For the purposes of this program of studies, communicative competence is represented by four interrelated and interdependent components.

Applications deal with what the students will be able to do with the language, the functions they will be able to perform and the contexts in which they will be able to operate.

Language Competence addresses the students' knowledge of the language and their ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used.

Global Citizenship aims to develop intercultural competence, with a particular focus on cultures associated with German.

Strategies help students learn and communicate more effectively and more efficiently.

Each of these components is described more fully at the beginning of the corresponding section of this program of studies.

Modes of Communication

Because of the focus on using language to communicate in specific contexts, with a particular purpose or task in mind, three modes of communication are used to organize some of the specific outcomes.

Interaction is most often direct, face-to-face oral communication, but it can take the form of written communication between individuals, using a medium such as e-mail where the exchange of information is fairly immediate. It is characterized principally by the opportunity to actively negotiate meaning; that is, helping others

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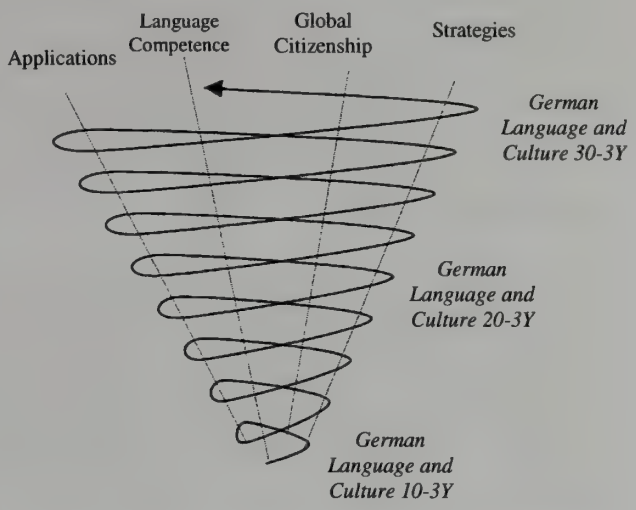
understand and working to understand others. Interactive communication generally requires more speed but less accuracy than the other two modes.

Interpretation is receptive communication of oral and written messages in contexts where the listener or reader is not in direct contact with the creator of the message. While there is no opportunity to ask for clarification, there is sometimes the possibility of rereading or listening again, consulting references, or making the meaning clearer in other ways. Reading and listening will sometimes involve **viewing** and interpreting visual elements, such as illustrations in books or moving images in television and film. Interpretation goes beyond a literal comprehension to include an understanding of some of the unspoken or unwritten meaning intended by the speaker or author.

Production is communication of oral and written messages in contexts where the audience is not in personal contact with the speaker or writer, or in situations of one-to-many communication; e.g., a lecture or a performance where there is no opportunity for the listener to interact with the speaker. Oral and written presentations will sometimes be enhanced by **representing** the meaning visually, using pictures, diagrams, models, drama techniques or other nonverbal forms of communication. Greater knowledge of the language and culture is required to ensure that communication is successful, since the participants cannot directly negotiate meaning.

A Spiral Progression

Language learning is integrative, not merely cumulative. Each new element that is added must be integrated into the whole of what has gone before. The model that best represents the students' language learning progress is an expanding spiral. Their progression is not only vertical (e.g., increased proficiency) but also horizontal (e.g., broader range of applications and experience with more vocabulary, text forms, contexts and so on). The spiral also represents how language learning activities are best structured. Particular lexical fields, learning strategies or language functions, for example, are revisited at different points in the program, but from a different perspective, in broader contexts or at a slightly higher level of proficiency each time. Learning is reinforced, extended and broadened with each successive pass.



ORGANIZATION OF THE PROGRAM OF STUDIES

General Outcomes

General outcomes are broad statements identifying the knowledge, skills and attitudes that students are expected to achieve in the course of their language learning experience. The four general outcomes serve as the foundation for this program of studies and are based on the conceptual model outlined above.

Applications [A]

- Students will use German in a variety of **situations** and for a variety of **purposes**.

Language Competence [LC]

- Students will understand and produce German **effectively** and **competently** in spoken and written forms.

Global Citizenship [GC]

- Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

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Strategies [S]

- Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

The order in which the general outcomes are presented in the program of studies does not represent a sequential order, nor does it indicate the relative importance of each component. The general outcomes are to be implemented in an integrated manner.

Specific Outcomes

Each general outcome is further broken down into specific outcomes that students are to achieve by the end of each course. The specific outcomes are interrelated and interdependent. In most classroom activities, a number of learning outcomes will be dealt with in an integrated manner.

The specific outcomes are categorized under cluster headings, which show the scope of each of the four general outcomes. These headings are shown in the table on the following page.

The specific outcomes are further categorized by strands, which show the developmental flow of learning from the beginning to the end of the program. However, an outcome for a particular course will not be dealt with only in that particular year of the program. The spiral progression that is part of the conceptual model means that activities in the years preceding will prepare the ground for acquisition and in the years following will broaden applications.

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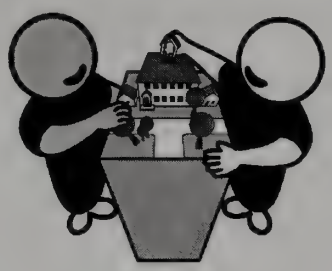
General Outcomes

Applications



Students will use German in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information
A–2 to express emotions and personal perspectives
A–3 to get things done
A–4 to form, maintain and change interpersonal relationships
A–5 to extend their knowledge of the world
A–6 for imaginative purposes and personal enjoyment

Language Competence

Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–1 interpret and produce oral texts
LC–2 interpret and produce written texts, graphics and images
LC–3 attend to form
LC–4 apply knowledge of how discourse is organized, structured and sequenced in German
LC–5 apply knowledge of the sociocultural context

Global Citizenship

Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

GC–1 historical and contemporary elements of the cultures of German-speaking peoples
GC–2 affirming and valuing diversity
GC–3 personal and career opportunities

Strategies

Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning
S–2 language use
S–3 general learning

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Guide to Reading the Program of Studies

General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

cluster heading for specific outcomes

LC–1 interpret and produce oral texts

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
LC–1.1 aural interpretation	a. understand the main points of short oral texts on familiar topics, in guided situations	a. understand the main points and some specific details of a variety of oral texts on familiar topics, in guided and unguided situations	a. understand short oral texts on a variety of topics, and understand the main points and specific details of oral texts on familiar topics
LC–1.2 oral production	a. produce short, simple oral texts, using familiar structures, in a variety of guided situations	a. produce simple oral texts on familiar topics, in a variety of guided situations	a. produce oral texts on familiar topics, in a variety of guided and unguided situations
LC–1.3 interactive fluency	a. interact, using a combination of words, phrases and simple sentences, in guided situations	a. interact, using a combination of phrases and sentences, in guided and unguided situations	a. initiate and manage short interactions

read each page vertically for outcomes expected at the end of each course

strand headings for specific outcomes

specific outcome statements for each course

read each page horizontally for developmental flow of outcomes from course to course

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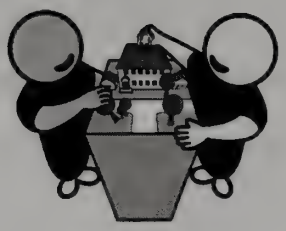

Applications

to express emotions and personal perspectives

to receive and impart information

to get things done

Students will use German in a variety of situations and for a variety of purposes.

to form, maintain and change interpersonal relationships

for imaginative purposes and personal enjoyment

to extend their knowledge of the world

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APPLICATIONS

The specific outcomes under the heading Applications deal with **what** the students will be able to do with the German language; that is, the **functions** they will be able to perform and the **contexts** in which they will be able to operate.

The functions are grouped under six cluster headings—see the illustration on the preceding page. Under each of these headings there are one or more strands that show the developmental flow of learning from course to course. Each strand, identified by a strand heading at the left end of a row, deals with a specific language function; e.g., share factual information. Students at any grade/course level will be able to share factual information. Beginning learners will do this in very simple ways. As students gain more knowledge and experience, they will broaden the range of subjects they can deal with, they will learn to share information in writing as well as orally, and they will be able to handle formal and informal situations.

Different models of communicative competence have organized language functions in a variety of ways. The organizational structure chosen here reflects the needs and interests of students in a classroom where activities are focused on meaning and are interactive. For example, the strand entitled "manage group actions" has been included to ensure that students acquire the German language skills necessary to function independently in small groups, since this is an effective way of organizing second language classrooms. The strands under the cluster heading "to extend their knowledge of the world" will accommodate a content-based approach to language learning where students learn content from another subject area as they learn the German language.

The level of linguistic, sociolinguistic and discourse competence that students will exhibit when carrying out the functions is defined in the specific outcomes for Language Competence for each course. To know how well students will be able to perform the specific function, the Applications outcomes must be read in conjunction with the Language Competence outcomes.

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General Outcome for Applications
Students will use German in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
A–1.1 share factual information	a. understand and respond to simple questions b. identify people, places and specific things c. ask for and provide basic information	a. seek out and provide information on a range of familiar topics b. describe several aspects of people, places and things c. describe series or sequences of events or actions	a. recount events that took place in the past b. understand and use definitions, comparisons and examples c. provide information on several aspects of a topic; e.g., give a simple report

A–2 to express emotions and personal perspectives

Students will be able to:

A–2.1 share ideas, thoughts, opinions, preferences	a. express a personal response and simple preferences b. ask about and identify favourite people, places, things and activities	a. express a personal response to a variety of situations b. inquire about and express preferences, and give simple reasons for preferences c. record and share thoughts and ideas with others	a. express, support and discuss opinions b. inquire about and express probability and certainty; e.g., *vielleicht, wahrscheinlich, bestimmt*
A–2.2 share emotions, feelings	a. identify and use expressions for a variety of emotions and feelings; e.g., ask and respond to questions about well-being (*Wie geht's?*)	a. inquire about, express and respond to emotions and feelings in a variety of familiar contexts; e.g., *Es tut mir leid. Das ist ja schön*	a. discuss and compare how people express emotions and feelings in a variety of situations

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General Outcome for Applications
Students will use German in a variety of **situations** and for a variety of **purposes**.

A–3 to get things done

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
A–3.1 guide actions of others	a. ask for permission, and make a variety of simple requests b. give and respond to simple oral instructions or commands c. suggest a course of action	a. give a simple set of instructions b. suggest a course of action in a variety of situations	a. give and respond to advice and warning b. lodge a complaint
A–3.2 state personal actions	a. express a wish or a desire to do something b. express ability or inability to do something c. state personal actions in the present	a. state personal actions in the past, present or future b. accept or decline an offer or invitation	a. express intention b. make a promise in a variety of situations c. accept or decline an offer or invitation, with explanations
A–3.3 manage group actions	a. express and manage turn taking b. encourage other group members to act appropriately c. ask for help or clarification of what is being said or done	a. negotiate in a simple way with peers in small-group tasks b. encourage other group members to participate c. assume a variety of roles and responsibilities as group members	a. express appreciation, support and respect for contributions of others b. express disagreement in an appropriate way

A–4 to form, maintain and change interpersonal relationships

Students will be able to:

A–4.1 manage personal relationships	a. exchange greetings and farewells b. address a new acquaintance, and introduce themselves c. exchange some basic personal information	a. make and respond to requests for personal information b. apologize and refuse politely c. initiate relationships	a. give and respond to compliments b. justify and explain own actions c. offer and respond to congratulations d. express regret e. initiate and participate in casual exchanges with others

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General Outcome for Applications
Students will use German in a variety of **situations** and for a variety of **purposes**.

A–5 to extend their knowledge of the world

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
A–5.1 discover and explore	a. ask questions to gain knowledge and clarify understanding, and seek information b. investigate the immediate environment	a. explore and express meaning in a variety of ways; e.g., drawing a diagram, making a model, rephrasing	a. explore connections among and gain new insights into familiar topics
A–5.2 gather and organize information	a. gather, organize, categorize and record simple information using a variety of resources; e.g., print, audio, visual, multimedia, human	a. compose questions to guide research, and gather information using a prepared format; e.g., interview	a. organize and manipulate information; e.g., transform information from texts into other forms, such as tables or diagrams
A–5.3 explore opinions and values	a. respond to the preferences, opinions, ideas and products of others b. recognize differences of opinion c. make connections between behaviour and values	a. compare personal views and opinions with those of others b. examine differing perspectives on an issue	a. express positions on an issue, and provide supporting reasons b. explore how values influence behaviour
A–5.4 solve problems	a. recognize a problem, and choose between given alternative solutions	a. identify a problem, and generate and evaluate alternative solutions to the problem	a. describe and analyze a problem, and use information collected from various sources to solve the problem

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General Outcome for Applications
Students will use German in a variety of **situations** and for a variety of **purposes**.

A–6 for imaginative purposes and personal enjoyment

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
A–6.1 humour/fun	a. use German for fun; e.g., rhymes, songs, games, poems, riddles	a. use German for fun and to interpret humour; e.g., cartoons, stories	a. use German for fun and to interpret and express humour; e.g., video clips, jokes
A–6.2 creative/aesthetic purposes	a. use German creatively; e.g., comic strip captions, concrete and/or acrostic poetry, stories	a. use German creatively; e.g., write poems based on simple, repetitive and modelled language	a. use German creatively; e.g., experiment with the sounds and rhythms of German, create a story, poem or rap
A–6.3 personal enjoyment	a. use German for personal enjoyment; e.g., make a collection of pictures, listen to songs	a. use German for personal enjoyment; e.g., communicate with German speakers	a. use German for personal enjoyment; e.g., watch video clips, films and television programs, use the Internet

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Language Competence

interpret and produce written texts, graphics and images

interpret and produce oral texts

attend to form

Students will understand and produce German effectively and competently in spoken and written forms.

apply knowledge of how discourse is organized, structured and sequenced in German

apply knowledge of the sociocultural context

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LANGUAGE COMPETENCE

Language competence is a broad term that includes linguistic or grammatical competence, discourse competence, sociolinguistic or sociocultural competence and what might be called textual competence. The specific outcomes under Language Competence deal with knowledge of the German language and the ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used. Language competence is best developed in the context of activities or tasks in which the language is used for real purposes; in other words, in practical **applications**.

The various components of language competence are grouped under five cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of language competence. For example, under the cluster heading "attend to form," there is a strand for phonology (pronunciation, stress, intonation), orthography (spelling, mechanical features), lexicon (vocabulary words and phrases) and grammatical elements (syntax and morphology).

Although the outcomes isolate these individual aspects, language competence should be developed through classroom activities that focus on meaningful uses of the German language and on **language in context**. Tasks will be chosen based on the needs, interests and experiences of students. The vocabulary, grammar structures, text forms and social conventions necessary to carry out a task will be taught, practised and assessed as students are involved in various aspects of the task itself, **not in isolation**.

Strategic competence is often closely associated with language competence, since students need to learn ways to compensate for low proficiency in the early stages of learning if they are to engage in authentic language use from the beginning. This component is included in the language use strategies in the Strategies section.

Grammatical elements that appear only in the "in modelled situations" or "in structured situations" sections still need to be evaluated. It is understood that it may take students some time before they are able to use these elements independently and consistently. Evaluation practices should reflect the developmental nature of the learning process.

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–1 interpret and produce oral texts

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
LC–1.1 aural interpretation	a. understand the main points of short oral texts on familiar topics, in guided situations	a. understand the main points and some specific details of a variety of oral texts on familiar topics, in guided and unguided situations	a. understand short oral texts on a variety of topics b. understand the main points and specific details of oral texts on familiar topics
LC–1.2 oral production	a. produce short, simple oral texts, using familiar structures, in a variety of guided situations	a. produce simple oral texts on familiar topics, in a variety of guided situations	a. produce oral texts on familiar topics, in a variety of guided and unguided situations
LC–1.3 interactive fluency	a. interact, using a combination of words, phrases and simple sentences, in guided situations	a. interact, using a combination of phrases and sentences, in guided and unguided situations	a. initiate and manage short interactions

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–2 interpret and produce written texts, graphics and images

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
LC–2.1 written interpretation	a. understand the main points of short written texts on familiar topics, in guided situations	a. understand the main points and some specific details of a variety of written texts on familiar topics, in guided and unguided situations	a. understand short written texts on a variety of topics, and understand the main points and specific details of written texts on familiar topics
LC–2.2 written production	a. produce short, simple written texts, using familiar structures, in a variety of guided situations	a. produce simple written texts on familiar topics, in a variety of guided situations	a. produce written texts in a variety of guided and unguided situations
LC–2.3 viewing	a. derive meaning from a variety of visuals and other forms of nonverbal communication, in guided situations	a. derive meaning from the visual elements of a variety of media, in guided and unguided situations	a. identify the purposes, intended audiences, messages and points of view in a variety of visual media, in guided situations
LC–2.4 representing	a. express meaning, using a variety of visuals and other forms of nonverbal communication, in guided situations	a. express meaning, using visual elements in a variety of media, in guided and unguided situations	a. communicate thoughts, ideas and feelings for specific purposes and audiences, through a variety of visual media, in guided situations

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–3 attend to form

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
LC–3.1 phonology	a. distinguish all the sounds of German b. pronounce learned words and phrases comprehensibly c. recognize and imitate intonation to express meaning	a. use comprehensible pronunciation, stress and intonation when producing familiar words or phrases	a. pronounce unfamiliar words comprehensibly
LC–3.2 orthography	a. recognize and use some basic spelling patterns, and recognize and use capitalization	a. apply common spelling rules b. recognize and use basic mechanical conventions; e.g., use of the comma	a. use spelling rules consistently to write familiar and unfamiliar words

LC–3.3 lexicon

a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including:

Personal Domain	**Education**	**Leisure and Recreation**	**Food**
• personal identity • relationships • pets, animals • the home • daily routines • future plans	• subjects and timetables • school facilities • classroom routines • school systems	• hobbies • interests • sports and exercise • entertainment • travel and vacation • transportation	• meals • restaurants • shopping • nutrition
Landeskunde	**Health and Body**	**Popular Culture**	**Other Areas**
• geography/topography • climate, weather, seasons • European context • contemporary life and issues • German civilization • literature and folklore	• body parts • illness and injury • clothing	• music • mass media • fashion • advertising	• any other lexical fields that meet the needs and interests of students

Note: Teachers may rearrange groupings and vary the emphasis on lexical fields to meet the needs and interests of students.

(continued)

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

(continued)

LC–3 attend to form

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
LC–3.4 grammatical elements	a. recognize and use, in modelled situations,[1] the following grammatical elements:		
	• modal verbs in present tense (e.g., *kann, darf*) and placement of infinitive (e.g., *Ich möchte Wasser trinken.*) • imperative mood (all forms) • sentence structure: time/manner/place • subordinate clauses beginning with *weil, dass* • prepositions with accusative and dative • position of adverbs of preference (e.g., *gern*) • structure of compound sentences	• reflexive verbs • sentence structure: subject, direct object, indirect object • relative clauses in nominative and accusative • nouns, personal pronouns in dative • adjectival endings (case, number and gender)	• sentence structure: subject–object inversion • prepositions with genitive • *da* and *wo* compounds (e.g., *wofür, darauf*) • possessive pronouns in genitive

(continued)

1. Modelled Situations: This term is used to describe learning situations where a model of specific linguistic elements is consistently provided and immediately available. Students in such situations will have an emerging awareness of the linguistic elements and will be able to apply them in very limited situations. Limited fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

(continued)

LC–3 attend to form

LC–3.4 grammatical elements

German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
Students will be able to:		
b. use, in structured situations,[2] the following grammatical elements:		
• compound nouns • perfect tense (limited selection of verbs) • separable verbs • articles with familiar nouns in nominative and accusative • possessive pronouns in nominative and accusative • negation (*nicht/kein*) • comparative form of adjectives (e.g., *kleiner als*) • formal address (*Sie* vs. *du, ihr*) • sentence structure: inversion following expressions of time and/or place (e.g., *Heute gehe ich ...*)	• plural of nouns • modal verbs in present tense • future tense • simple past forms: *hatte, war* • imperative mood (all forms) • personal pronouns in accusative • sentence structure: time/manner/place • subordinate clauses beginning with *weil, dass* • prepositions with accusative and dative • possessive pronouns in dative • infinitive phrases and clauses (e.g., *Ich plane, nach Deutschland zu reisen. Oma geht in die Stadt, um das Museum zu besuchen.*) • formal address (*Sie* vs. *du, ihr*) • position of adverbs of preference (e.g., *gern*) • structure of compound sentences	• simple past • modal verbs in simple past (e.g., *konnte, musste*) • reflexive verbs • sentence structure: subject, object, indirect object • relative clauses in nominative and accusative • personal pronouns in dative • adjectival endings (case, number, gender) • comparison of adjectives (all forms) • position of adverbs of preference (e.g., *gern*) • structure of compound sentences

(continued)

2. Structured Situations: This term is used to describe learning situations where a familiar context for the use of specific linguistic elements is provided and students are guided in the use of these linguistic elements. Students in such situations will have increased awareness and emerging control of the linguistic elements and will be able to apply them in familiar contexts with teacher guidance. Student language is characterized by increasing fluency and confidence.

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

(continued)

LC–3 attend to form

LC–3.4 grammatical elements

German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
Students will be able to:		
c. use, independently and consistently,[3] the following grammatical elements:		
• gender and plural of familiar nouns • noun and verb agreement with familiar words • present tense • personal pronouns in nominative • structure of simple declarative sentences (e.g., *Karl kauft einen Hut. Gabi wohnt hier.*) • yes/no questions (e.g., *Hast du eine Katze?*) • simple questions using *wer, wie, was, wo* • coordinating conjunctions (*und, oder, aber*)	• compound nouns • perfect tense • separable verbs • possessive pronouns in nominative and accusative • negation (*nicht/kein*) • comparative form of adjectives (e.g., *kleiner als*) • sentence structure: inversion following expressions of time and/or place (e.g., *Heute gehe ich ...*)	• plural of nouns • modal verbs in present tense • future tense • simple past forms: *hatte, war* • imperative mood (all forms) • personal pronouns in accusative • sentence structure: time/manner/place • subordinate clauses beginning with *weil, dass* • possessive pronouns in dative • prepositions with accusative and dative • infinitive phrases and clauses • formal address (*Sie* vs. *du, ihr*)

3. Independently and consistently: This term is used to describe learning situations where students use specific linguistic elements in a variety of contexts with limited teacher guidance. Students in such situations will have consistent control of the linguistic elements and will be able to apply them in a variety of contexts with limited teacher guidance. Fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–4 apply knowledge of how discourse is organized, structured and sequenced in German

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
LC–4.1 text forms	a. identify and use a limited variety of oral and print text forms	a. identify and use a variety of oral and print text forms	a. use knowledge of text forms to enhance comprehension and production of texts
LC–4.2 patterns of social interaction	a. initiate interactions and respond using simple interaction patterns; e.g., greeting–response, question–answer	a. initiate, respond to and close interactions, using a variety of social interaction patterns; e.g., agreement/ disagreement–reaction, request–acceptance/ nonacceptance	a. use a range of social interaction patterns in guided and unguided situations
LC–4.3 cohesion/coherence	a. link words, phrases and simple sentences using basic connectors; e.g., *und, oder, aber* b. link several sentences coherently	a. use common conventions to organize texts; e.g., titles, paragraphs b. sequence elements of a simple story, process or series of events using basic expressions of time; e.g., *zuerst, heute, dann, morgen* c. use referents, such as personal and demonstrative pronouns, within texts	a. organize and produce coherent texts, using a variety of conventions; e.g., time sequencing, cause and effect, instructions

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–5 apply knowledge of the sociocultural context

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
LC–5.1 register	a. distinguish between formal and informal situations	a. use formal and informal language appropriately in familiar situations	a. explore formal and informal uses of language in a variety of contexts
LC–5.2 idiomatic expressions	a. understand and use selected idiomatic expressions	a. use learned idiomatic expressions in familiar contexts	a. identify unfamiliar idiomatic expressions in a variety of contexts b. explore and interpret idiomatic expressions in popular, contemporary culture
LC–5.3 variations in language	a. recognize individual differences in spoken German; e.g., age, individual speech pattern, social context	a. experience regional and other differences in German as spoken throughout the world	a. recognize and adapt to regional and other differences in German as spoken throughout the world
LC–5.4 social conventions	a. use basic forms and conventions of politeness in guided situations; e.g., *danken, bitten, Hand geben* b. use appropriate oral forms of address in guided situations; e.g., *du/Sie, Herr/Frau*	a. use basic forms and conventions of politeness in guided and unguided situations b. use appropriate oral forms of address in guided and unguided situations	a. use basic forms and conventions of politeness, and use appropriate oral forms of address b. interpret social conventions encountered in oral and written texts and situations
LC–5.5 nonverbal communication	a. understand some common nonverbal behaviours in familiar contexts; e.g., etiquette, table manners	a. understand and use some common nonverbal behaviours in familiar contexts; e.g., length of eye contact b. recognize nonverbal behaviours that are considered impolite	a. understand and use common nonverbal behaviours in a variety of contexts; e.g., norms of personal space b. avoid nonverbal behaviours that are considered impolite

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Global Citizenship

historical and contemporary elements of the cultures of German-speaking peoples

affirming and valuing diversity

Students will acquire the knowledge, skills and attitudes to be effective global citizens, through the exploration of the cultures of the German-speaking world.

personal and career opportunities

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GLOBAL CITIZENSHIP

The learning outcomes for Global Citizenship deal with the development of intercultural competence, encompassing some of the knowledge, skills and attitudes that students need in order to be effective global citizens. The concept of global citizenship encompasses citizenship at all levels, from the local school and community to Canada and the world.

The various components of global citizenship are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of intercultural competence. For example, under the cluster heading "historical and contemporary elements of the cultures of German-speaking peoples," there are strands for gaining/applying knowledge of German cultures, diversity within German cultures, analyzing cultural knowledge and valuing German cultures.

Developing cultural knowledge and skills is a lifelong process. Knowledge of one's own culture is acquired over a lifetime. Cultures change over time. Within any national group, there may be a dominant culture or cultures and a number of additional cultures. Rather than developing a bank of knowledge about German cultures, it is more important for students to develop skills in accessing and understanding information about cultures and in applying that knowledge for the purposes of interaction and communication. Students will gain cultural knowledge in the process of developing these skills. In this way, if they encounter elements of the German cultures they have not learned about in class, they will have the skills and abilities to deal with them effectively and appropriately.

The "affirming and valuing diversity" heading covers knowledge, skills and attitudes that are developed as a result of bringing other languages and cultures into relationship with one's own. There is a natural tendency when learning a new language and culture to compare it with what is familiar. Many students leave a second language learning experience with a heightened awareness and knowledge of their own language and culture. They will also be able to make some generalizations about languages and cultures based on their experiences and those of their classmates, who may have a variety of cultural backgrounds. This will provide students with an understanding of diversity within both a global and a Canadian context.

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

GC–1 historical and contemporary elements of the cultures of German-speaking peoples

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
GC–1.1 gaining/applying knowledge of German cultures	a. observe and participate in activities and experiences that are common among German-speaking peoples; e.g., festivities, cultural events, music, food b. identify similarities between German people their own age and themselves; e.g., music, clothing, sports	a. explore some important elements of German cultures in their own school, home, community and beyond; e.g., names, products, sports b. apply knowledge of German cultures to interpret behaviour that is different from their own	a. explore and identify some important aspects of German culture and history; e.g., fairy tales, stories, movies, key historic events and their lasting impact
GC–1.2 diversity within German cultures	a. identify major German-speaking groups throughout the world b. identify the various German-speaking countries and their diversity; e.g., maps, flags, weather	a. explore regional differences among people living in German-speaking countries; e.g., food, dialects, costumes, celebrations b. recognize the ethnic diversity and multicultural nature of German-speaking countries	a. recognize and explore the impact of diversity on contemporary German-speaking communities
GC–1.3 analyzing cultural knowledge	a. ask questions about aspects of German cultures being studied, and compare those aspects of German cultures with their own; e.g., leisure time, daily routines, part-time jobs b. recognize the existence of stereotypes about and within German cultures	a. use a variety of sources of information and research skills to find out about German cultures b. explore some common stereotypes of German cultures, and explore their origins	a. organize and present information about elements of German cultures in a variety of ways b. analyze own assumptions and perspectives about German cultures and peoples
GC–1.4 valuing German cultures	a. show a willingness to participate in cultural activities and experiences b. express interest in finding out about German-speaking youth	a. recognize and describe some contributions of German cultures to global society and their own society	a. seek out and use opportunities to interact with German-speaking people in the community and throughout the world

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

GC–2 affirming and valuing diversity

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
GC–2.1 awareness of English	a. identify similarities and differences between English and German; e.g., sounds, words, structures, writing conventions, cognates	a. identify some English words that have been adopted from German (e.g., angst), and identify some German words that have been adopted from English (e.g., *Handy*) b. recognize the existence of cognates whose meanings vary in English and German (false friends); e.g., to become/*bekommen*	a. analyze the ways that English and German are significantly different and the ways that they are the same
GC–2.2 general language knowledge	a. recognize that languages can be grouped into families based on common origins b. recognize that languages using the same writing system may have differing pronunciations for the same letters/symbols c. recognize that different languages have different writing systems	a. recognize that within a linguistic group, people from different regions and/or social contexts may use differing pronunciation, vocabulary and structure b. identify regional and/or social differences in pronunciation and vocabulary in various languages within their personal experience	a. identify how and why languages borrow from one another b. recognize that languages and their status evolve/change over time
GC–2.3 awareness of Canadian culture	a. recognize and identify similarities and differences between Canadian and German cultures	a. compare and contrast diversity in the German and Canadian cultures	a. identify shared references and significant events that have had an impact on both Canadian and German cultures

(continued)

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

(continued)

GC–2 affirming and valuing diversity

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
GC–2.4 general cultural knowledge	a. recognize that culture is expressed through a variety of forms; e.g., behaviour, stories	a. recognize that people of a specific culture may have perspectives that differ from those of people in other cultures	a. recognize that different cultures may have different interpretations of texts, cultural practices or products
	b. recognize that speakers of the same language may come from different cultural backgrounds	b. identify the limitations of adopting a single perspective	b. recognize that communication can be affected by different cultural practices; e.g., gestures, perspectives and values
	c. recognize that geography, climate and history affect the culture of a particular region	c. explore and seek out information about other cultures through the medium of German	c. seek out opportunities to interact with people from other cultures who have an interest in learning about the German language and cultures
GC–2.5 intercultural skills	a. recognize various ways of coping with linguistically and culturally unfamiliar situations	a. apply interpersonal skills to cope with linguistically and culturally unfamiliar situations	a. explore various strategies for enhancing communication with people from German and other cultures

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

GC–3 personal and career opportunities

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
GC–3.1 German language and culture	a. identify a variety of reasons for learning German b. identify some careers for which knowledge of German is useful c. recognize that knowledge of an additional language is an asset to any career	a. demonstrate awareness of opportunities for further study or careers related to German b. identify some places that they could visit and use their knowledge of German language and culture c. identify some personal uses they have made of their knowledge of German language and culture	a. explore opportunities for further studies or careers related to German b. identify aspects of German cultures that are of personal interest
GC–3.2 cultural and linguistic diversity	a. suggest some reasons for learning an additional language b. suggest some reasons for participating in activities and experiences that reflect elements of different cultures	a. identify some personal uses they have made of their knowledge of different languages and cultures b. identify some careers for which knowledge of different languages and cultures is useful c. identify some countries where there is significant linguistic and cultural diversity	a. identify aspects of the history, literature, arts and crafts of different cultures that are of personal interest b. identify some careers that use knowledge of international languages and cultures, and intercultural skills

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Strategies

language learning

language use

Students will know and use various strategies to maximize the effectiveness of learning and communication.

general learning

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STRATEGIES

Under the Strategies heading are specific outcomes that will help students learn and communicate more **effectively**. Strategic competence has long been recognized as an important component of communicative competence. The learning outcomes that follow deal not only with compensation and repair strategies, important in the early stages of language learning when proficiency is low, but with strategies for language learning, language use in a broader sense, as well as general learning strategies that help students acquire content. Although people may use strategies unconsciously, the learning outcomes deal only with the **conscious use** of strategies.

The strategies are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands that show the development of awareness and skill in using strategies from course to course. Each strand, identified by a strand heading at the left end of the row, deals with a specific category of strategy. Language learning and general learning strategies are categorized as cognitive, metacognitive and social/affective. The language use strategies are organized by communicative mode: receptive, productive, interactive.

The strategies that students choose depend on the task they are engaged in as well as on other factors, such as their preferred learning style, personality, age, attitude and cultural background. Strategies that work well for one person may not be effective for another person, or may not be suitable in a different situation. For this reason it is not particularly useful to say that students should be aware of, or able to use, a specific strategy in a particular course. Consequently, the specific outcomes describe the students' knowledge of, and ability to use, general types of strategies. More specific strategies for each general category or type are included in the sample list of strategies below. The specific strategies provided in the sample list **are not prescriptive** but are provided as an illustration of how the general strategies in the specific outcomes might be developed.

Teachers need to know and be able to demonstrate a broad range of strategies from which students are then able to choose in order to communicate effectively. Strategies of all kinds are best taught in the context of learning activities where students can apply them immediately and then reflect on their use.

SAMPLE LIST OF STRATEGIES

Language Learning Strategies

Cognitive

- listen attentively
- perform actions to match words of a song, story or rhyme
- learn short rhymes or songs, incorporating new vocabulary or sentence patterns
- imitate sounds and intonation patterns
- memorize new words by repeating them silently or aloud
- seek the precise term to express meaning
- repeat words or phrases in the course of performing a language task
- make personal dictionaries
- experiment with various elements of the language
- use mental images to remember new information
- group together sets of things—vocabulary, structures—with similar characteristics
- identify similarities and differences between aspects of the German language and own language
- look for patterns and relationships
- use previously acquired knowledge to facilitate a learning task
- associate new words or expressions with familiar ones, either in German or in own language
- find information, using reference materials like dictionaries, textbooks and grammars
- use available technological aids to support language learning; e.g., cassette recorders, computers
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember

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- place new words or expressions in a context to make them easier to remember
- use induction to generate rules governing language use
- seek opportunities outside of class to practise and observe
- perceive and note down unknown words and expressions, noting also their context and function

Metacognitive
- check copied writing for accuracy
- make choices about how you learn
- rehearse or role-play language
- decide in advance to attend to the learning task
- reflect on learning tasks with the guidance of the teacher
- make a plan in advance about how to approach a language learning task
- reflect on the listening, reading and writing process
- decide in advance to attend to specific aspects of input
- listen or read for key words
- evaluate own performance or comprehension at the end of a task
- keep a learning log
- experience various methods of language acquisition, and identify one or more considered to be particularly useful personally
- be aware of the potential of learning through direct exposure to the language
- know how strategies may enable coping with texts containing unknown elements
- identify problems that might hinder successful completion of a task, and seek solutions
- monitor own speech and writing to check for persistent errors
- be aware of own strengths and weaknesses, identify own needs and goals, and organize strategies and procedures accordingly

Social/Affective
- initiate or maintain interaction with others
- participate in shared reading experiences
- seek the assistance of a friend to interpret a text
- reread familiar self-chosen texts to enhance understanding and enjoyment
- work cooperatively with peers in small groups
- understand that making mistakes is a natural part of language learning
- experiment with various forms of expression, and note their acceptance or nonacceptance by more experienced speakers
- participate actively in brainstorming and conferencing as prewriting and postwriting exercises
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- repeat new words and expressions occurring in own conversations, and make use of these new words and expressions as soon as appropriate
- reduce anxiety by using mental techniques, such as positive self-talk or humour
- work with others to solve problems, and get feedback on tasks
- provide personal motivation by arranging own rewards when successful

Language Use Strategies

Receptive
- determine the purpose of listening
- assess own information needs before listening, viewing or reading
- prepare questions or a guide to note down information found in the text
- make predictions about what you expect to hear or read based on prior knowledge and personal experience
- listen selectively based on purpose
- listen or look for key words
- use key content words or discourse markers to follow an extended text
- use skimming and scanning to locate key information in texts
- use illustrations to aid reading comprehension
- infer probable meanings of unknown words or expressions from contextual clues
- use knowledge of the sound–symbol system to aid reading comprehension
- reread several times to understand complex ideas
- observe gestures, intonation and visual supports to aid comprehension
- summarize information gathered

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- make connections between texts on the one hand and prior knowledge and personal experience on the other

Productive

- mimic what the teacher says
- use nonverbal means to communicate
- copy what others say or write
- use words visible in the immediate environment
- be aware of and use the steps of the writing process: prewriting (gathering ideas, planning the text, researching, organizing the text), writing, revision (rereading, moving pieces of text, rewriting pieces of text), correction (grammar, spelling, punctuation), publication (reprinting, adding illustrations, binding)
- use various techniques to explore ideas at the planning stage, such as brainstorming or keeping a notebook or log of ideas
- use familiar repetitive patterns from stories, songs, rhymes or media
- use illustrations to provide detail when producing own texts
- use familiar sentence patterns to form new sentences
- take notes when reading or listening to assist in producing own text
- compensate for avoiding difficult structures by rephrasing
- use resources to increase vocabulary
- use descriptions, explanations or various words and phrases to compensate for lack of specific terms (circumlocution)
- use a variety of resources to correct texts; e.g., personal and commercial dictionaries, checklists, grammars
- apply grammar rules to improve accuracy at the correction stage
- revise and correct final version of text

Interactive

- indicate lack of understanding verbally or nonverbally; e.g., *Entschuldigung, Wie bitte?, Das habe ich nicht verstanden*, raised eyebrows, blank look
- interpret and use a variety of nonverbal cues to communicate; e.g., mime, pointing, gestures, drawing pictures
- ask for clarification or repetition when you do not understand; e.g., *Was meinen Sie damit?, Wiederholen Sie, bitte!*
- ask for confirmation that a form used is correct; e.g., *Kann man das sagen?, Wie heißt das auf Deutsch?*
- use other speakers' words in subsequent conversations
- use descriptions, explanations or various words and phrases to compensate for lack of specific terms (circumlocution)
- assess feedback from a conversation partner to recognize if a message has been understood
- start again, using a different tactic, when communication breaks down
- use fillers, hesitation devices and gambits to sustain conversations; e.g., *Na ja, gut, nicht wahr*

General Learning Strategies

Cognitive

- classify objects and ideas according to their attributes; e.g., red objects and blue objects, or animals that eat meat and animals that eat plants
- use models
- connect what is already known with what is being learned
- experiment with and concentrate on one thing at a time
- focus on and complete learning tasks
- record key words and concepts in abbreviated form—verbal, graphic or numerical—to assist with performance of a learning task
- use mental images to remember new information
- distinguish between fact and opinion when using a variety of sources of information
- formulate key questions to guide research
- make inferences, and identify and justify the evidence on which these inferences are based
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember
- seek information through a network of sources, including libraries, the Internet, individuals and agencies
- use previously acquired knowledge or skills to assist with a new learning task

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Metacognitive

- reflect on learning tasks with the guidance of the teacher
- choose from various study techniques
- discover how own efforts can affect learning
- reflect upon own thinking processes and how you learn
- decide in advance to attend to the learning task
- divide an overall learning task into a number of subtasks
- make a plan in advance about how to approach a task
- identify own needs and interests
- manage own physical working environment
- keep a learning journal, such as a diary or a log
- develop criteria for evaluating own work
- work with others to monitor own learning
- take responsibility for planning, monitoring and evaluating learning experiences

Social/Affective

- watch others' actions and copy them
- seek help from others
- follow own natural curiosity and intrinsic motivation to learn
- participate in cooperative group learning tasks
- choose learning activities that enhance understanding and enjoyment
- be encouraged to try, even though mistakes may be made
- take part in group decision-making processes
- use support strategies to help peers persevere at learning tasks; e.g., offer encouragement, praise, ideas
- take part in group problem-solving processes
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- monitor own level of anxiety about learning tasks, and take measures to lower it if necessary; e.g., deep breathing, laughter
- use social interaction skills to enhance group learning activities

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
S–1.1 cognitive	a. use simple cognitive strategies, with guidance, to enhance language learning; e.g., memorize new words by repeating them silently or aloud, make personal dictionaries, identify and use cognates	a. identify and use a variety of cognitive strategies to enhance language learning; e.g., identify patterns for noun endings, such as *-ung*, find and apply information using reference materials like dictionaries, textbooks and grammars	a. select and use a variety of cognitive strategies to enhance language learning; e.g., seek the precise term, look for patterns and relationships
S–1.2 metacognitive	a. use simple metacognitive strategies, with guidance, to enhance language learning; e.g., identify own strengths and needs, check copied writing for accuracy, listen or read for key words to derive general meaning	a. identify and use a variety of metacognitive strategies to enhance language learning; e.g., reflect on the listening, reading and writing process, plan in advance how to approach a task	a. select and use a variety of metacognitive strategies to enhance language learning; e.g., monitor speech and writing to check for persistent errors, evaluate own performance
S–1.3 social/affective	a. use simple social and affective strategies, with guidance, to enhance language learning; e.g., work cooperatively with peers in small groups, seek assistance, understand that making mistakes is a natural part of language learning	a. identify and use a variety of social and affective strategies to enhance language learning; e.g., be willing to take risks, try unfamiliar tasks and approaches, work with others to solve problems, get feedback on tasks	a. select and use a variety of social and affective strategies to enhance language learning; e.g., brainstorm, experiment with various forms of expression

Further examples of language learning strategies are available on pages 30 and 31.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–2 language use

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
S–2.1 receptive	a. use simple reading and listening strategies, with guidance, to aid comprehension; e.g., illustrations, familiar words	a. identify and use a variety of reading and listening strategies to aid comprehension; e.g., make inferences based on prior knowledge and experiences	a. select and use a variety of reading and listening strategies to aid comprehension; e.g., use skimming and/or scanning to locate key information
S–2.2 productive	a. use simple speaking and writing strategies, with guidance; e.g., experiment with familiar words and structures to express own meaning	a. identify and use a variety of speaking and writing strategies; e.g., compensate for difficult structures by rephrasing, apply grammar rules to improve accuracy	a. select and use a variety of speaking and writing strategies; e.g., use a variety of resources to correct texts, experiment with multiple ways of expressing meaning
S–2.3 interactive	a. use simple interactive strategies, with guidance; e.g., indicate lack of understanding verbally or nonverbally, use different words to start again when communication breaks down	a. identify and use a variety of interactive strategies; e.g., ask for clarification or repetition, ask for confirmation that a form used is correct	a. select and use a variety of interactive strategies; e.g., use other speakers' words in subsequent conversations

Further examples of language use strategies are available on pages 31 and 32.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–3 general learning

	German Language and Culture 10-3Y	German Language and Culture 20-3Y	German Language and Culture 30-3Y
	Students will be able to:		
S–3.1 cognitive	a. use simple cognitive strategies to enhance general learning; e.g., connect what they already know with what they are learning	a. identify and use a variety of cognitive strategies to enhance general learning; e.g., take notes, organize and review notes	a. select and use a variety of cognitive strategies to enhance general learning; e.g., formulate key questions to guide inquiry
S–3.2 metacognitive	a. use simple metacognitive strategies to enhance general learning; e.g., discover how own efforts can affect learning	a. identify and use a variety of metacognitive strategies to enhance general learning; e.g., make a plan in advance about how to approach a task	a. select and use a variety of metacognitive strategies to enhance general learning; e.g., reflect upon their thinking processes and how they learn
S–3.3 social/affective	a. use simple social and affective strategies to enhance general learning; e.g., seek help from others	a. identify and use a variety of social and affective strategies to enhance general learning; e.g., encourage themselves to try even though they might make mistakes	a. select and use a variety of social and affective strategies to enhance general learning; e.g., take risks, try unfamiliar tasks and approaches

Further examples of general learning strategies are available on pages 32 and 33.

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GERMAN LANGUAGE AND CULTURE 10-6Y, 20-6Y, 30-6Y

This program of studies is intended for students who began their study of German language and culture in Grade 7. It constitutes the last three years of the German Language and Culture Six-year (6Y) Program. The German Language and Culture Six-year Program, Grades 7–8–9, constitutes the first three years of the six-year program.

INTRODUCTION

Studying the German language opens the door to understanding and participating in an influential world culture with close relationships to both the English language and our contemporary way of life.

Communication with people living in much of northern and central Europe is possible for those who know the German language. Approximately 120 million people speak German; it is the official language of Austria and Germany, and it is one of several official languages in Liechtenstein, Luxembourg and Switzerland. In Belgium and Denmark, German is a language with special status.

German can be an important key to communication in many parts of the world beyond the German-speaking nations as well. In eastern Europe, for example, the use of German as a major language of business has been increasing in recent years. According to Canada's 2001 Census, German is Canada's fifth most common mother tongue. In Alberta, about 78 000 people reported German as their mother tongue in that same year.

Learning German as another language is to embark on a profound experience of cross-cultural exploration. Contributions from German culture have shaped such areas as science, technology, music, religion and politics, to name but a few. Over the centuries, German has had significant impact, in both positive and negative ways, far beyond the borders of nations where the language is spoken.

For those students who already have some knowledge of German, or a family connection to the culture, there is the opportunity to renew contact with their ancestral language and culture or to maintain and develop literacy in a first language that is not the majority language in the community.

The value, for Canadian society as a whole, of learning German can be summarized as follows. Learning German leads to:

- an increased awareness of, and sensitivity to, cultural and linguistic diversity
- an enhanced role in the international community
- improved potential in the Canadian and the global marketplace and workplace.

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There are also many personal reasons for learning German. Students who have no previous knowledge of the language can look forward to:

- more opportunity to communicate directly with German-speaking people and gain a deeper insight into their own culture and language
- a broader range of educational, career and leisure opportunities
- the opportunity to meet the entrance requirements of many post-secondary institutions in Alberta and across Canada.

Students receive additional, indirect benefits from learning German as another language, including:

- development of increased competence in their use of English or in other languages they may know
- enhanced cognitive functioning, particularly an increased ability to conceptualize and to think abstractly; more cognitive flexibility; and greater divergent thinking, creativity and metalinguistic competence.

ASSUMPTIONS

The following statements are assumptions that have guided the development process of this program of studies.

- Language is communication.
- Language is culture.
- All students can be successful learners of language and culture, although they will learn in a variety of ways and acquire proficiency at varied rates.
- All languages can be taught and learned.
- Learning German as another language leads to enhanced learning in both the student's primary language and in related areas of cognitive development and knowledge acquisition. This is true of students who come to the class with some background knowledge of German and develop literacy skills in the language. It is also true for students who have no cultural or linguistic background in German and are studying German as a second language.

THE CONCEPTUAL MODEL

The aim of this program of studies is the development of communicative competence in the German language.

Four Components

For the purposes of this program of studies, communicative competence is represented by four interrelated and interdependent components.

Applications deal with what the students will be able to do with the language, the functions they will be able to perform and the contexts in which they will be able to operate.

Language Competence addresses the students' knowledge of the language and their ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used.

Global Citizenship aims to develop intercultural competence, with a particular focus on cultures associated with German.

Strategies help students learn and communicate more effectively and more efficiently.

Each of these components is described more fully at the beginning of the corresponding section of this program of studies.

Modes of Communication

Because of the focus on using language to communicate in specific contexts, with a particular purpose or task in mind, three modes of communication are used to organize some of the specific outcomes.

Interaction is most often direct, face-to-face oral communication, but it can take the form of written communication between individuals, using a medium such as e-mail where the exchange of information is fairly immediate. It is characterized principally by the opportunity to actively negotiate meaning; that is, helping others

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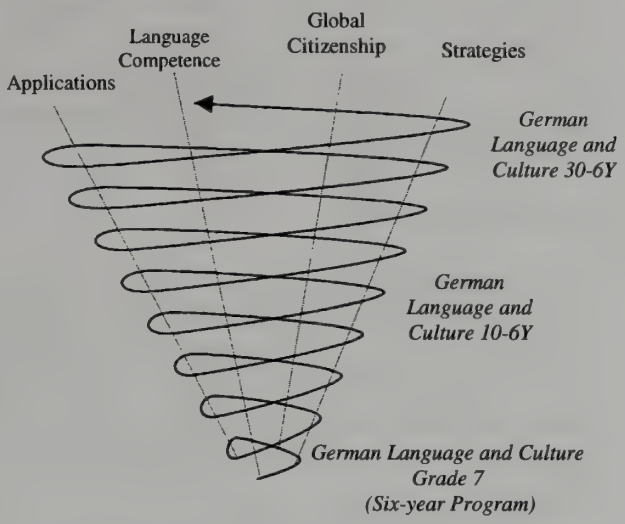
understand and working to understand others. Interactive communication generally requires more speed but less accuracy than the other two modes.

Interpretation is receptive communication of oral and written messages in contexts where the listener or reader is not in direct contact with the creator of the message. While there is no opportunity to ask for clarification, there is sometimes the possibility of rereading or listening again, consulting references, or making the meaning clearer in other ways. Reading and listening will sometimes involve **viewing** and interpreting visual elements, such as illustrations in books or moving images in television and film. Interpretation goes beyond a literal comprehension to include an understanding of some of the unspoken or unwritten meaning intended by the speaker or author.

Production is communication of oral and written messages in contexts where the audience is not in personal contact with the speaker or writer, or in situations of one-to-many communication; e.g., a lecture or a performance where there is no opportunity for the listener to interact with the speaker. Oral and written presentations will sometimes be enhanced by **representing** the meaning visually, using pictures, diagrams, models, drama techniques or other nonverbal forms of communication. Greater knowledge of the language and culture is required to ensure that communication is successful, since the participants cannot directly negotiate meaning.

A Spiral Progression

Language learning is integrative, not merely cumulative. Each new element that is added must be integrated into the whole of what has gone before. The model that best represents the students' language learning progress is an expanding spiral. Their progression is not only vertical (e.g., increased proficiency) but also horizontal (e.g., broader range of applications and experience with more vocabulary, text forms, contexts and so on). The spiral also represents how language learning activities are best structured. Particular lexical fields, learning strategies or language functions, for example, are revisited at different points in the program, but from a different perspective, in broader contexts or at a slightly higher level of proficiency each time. Learning is reinforced, extended and broadened with each successive pass.



ORGANIZATION OF THE PROGRAM OF STUDIES

General Outcomes

General outcomes are broad statements identifying the knowledge, skills and attitudes that students are expected to achieve in the course of their language learning experience. The four general outcomes serve as the foundation for this program of studies and are based on the conceptual model outlined above.

Applications [A]

- Students will use German in a variety of **situations** and for a variety of **purposes**.

Language Competence [LC]

- Students will understand and produce German **effectively** and **competently** in spoken and written forms.

Global Citizenship [GC]

- Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

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Strategies [S]

- Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

The order in which the general outcomes are presented in the program of studies does not represent a sequential order, nor does it indicate the relative importance of each component. The general outcomes are to be implemented in an integrated manner.

Specific Outcomes

Each general outcome is further broken down into specific outcomes that students are to achieve by the end of each course. The specific outcomes are interrelated and interdependent. In most classroom activities, a number of learning outcomes will be dealt with in an integrated manner.

The specific outcomes are categorized under cluster headings, which show the scope of each of the four general outcomes. These headings are shown in the table on the following page.

The specific outcomes are further categorized by strands, which show the developmental flow of learning from the beginning to the end of the program. However, an outcome for a particular course will not be dealt with only in that particular year of the program. The spiral progression that is part of the conceptual model means that activities in the years preceding will prepare the ground for acquisition and in the years following will broaden applications.

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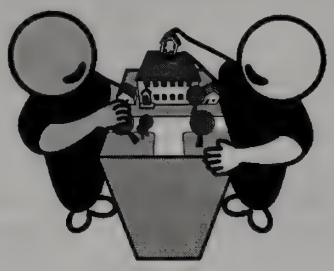
General Outcomes

Applications



Students will use German in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information
A–2 to express emotions and personal perspectives
A–3 to get things done
A–4 to form, maintain and change interpersonal relationships
A–5 to extend their knowledge of the world
A–6 for imaginative purposes and personal enjoyment

Language Competence

Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–1 interpret and produce oral texts
LC–2 interpret and produce written texts, graphics and images
LC–3 attend to form
LC–4 apply knowledge of how discourse is organized, structured and sequenced in German
LC–5 apply knowledge of the sociocultural context

Global Citizenship

Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

GC–1 historical and contemporary elements of the cultures of German-speaking peoples
GC–2 affirming and valuing diversity
GC–3 personal and career opportunities

Strategies

Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning
S–2 language use
S–3 general learning

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

cluster heading for specific outcomes

LC–1 interpret and produce oral texts

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
LC–1.1 aural interpretation	a. understand the main points and some specific details of a variety of oral texts on familiar topics, in guided and unguided situations	a. understand short oral texts on a variety of topics	a. understand oral texts on a broad variety of topics
LC–1.2 oral production	a. produce simple oral texts on familiar topics, in guided and unguided situations	a. produce oral texts on familiar topics, in guided and unguided situations	a. produce a variety of oral texts, with guidance
LC–1.3 interactive fluency	a. initiate and manage short interactions, with pauses for planning and repair	a. initiate and manage simple interactions without undue difficulty, asking for repetition or clarification when necessary	a. engage, spontaneously, in routine and nonroutine interactions

read each page vertically for outcomes expected at the end of each course

strand headings for specific outcomes

specific outcome statements for each course

read each page horizontally for developmental flow of outcomes from course to course

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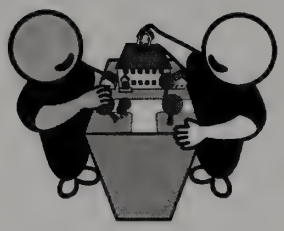

Applications

to express emotions and personal perspectives

to receive and impart information

to get things done

Students will use German in a variety of situations and for a variety of purposes.

to form, maintain and change interpersonal relationships

for imaginative purposes and personal enjoyment

to extend their knowledge of the world

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APPLICATIONS

The specific outcomes under the heading Applications deal with **what** the students will be able to do with the German language; that is, the **functions** they will be able to perform and the **contexts** in which they will be able to operate.

The functions are grouped under six cluster headings—see the illustration on the preceding page. Under each of these headings there are one or more strands, which show the developmental flow of learning from course to course. Each strand, identified by a strand heading at the left end of a row, deals with a specific language function; e.g., share factual information. Students at any grade/course level will be able to share factual information. Beginning learners will do this in very simple ways. As students gain more knowledge and experience, they will broaden the range of subjects they can deal with, they will learn to share information in writing as well as orally, and they will be able to handle formal and informal situations.

Different models of communicative competence have organized language functions in a variety of ways. The organizational structure chosen here reflects the needs and interests of students in a classroom where activities are focused on meaning and are interactive. For example, the strand entitled "manage group actions" has been included to ensure that students acquire the German language skills necessary to function independently in small groups, since this is an effective way of organizing second language classrooms. The strands under the cluster heading "to extend their knowledge of the world" will accommodate a content-based approach to language learning where students learn content from another subject area as they learn the German language.

The level of linguistic, sociolinguistic and discourse competence that students will exhibit when carrying out the functions is defined in the specific outcomes for Language Competence for each course. To know how well students will be able to perform the specific function, the Applications outcomes must be read in conjunction with the Language Competence outcomes.

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General Outcome for Applications
Students will use German in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
A–1.1 share factual information	a. seek out and provide information on several aspects of a topic; e.g., give a simple report b. understand and use definitions, comparisons and examples	a. present detailed information on a specific topic; e.g., report, biography	a. comprehend and recount events that took place in the past; e.g., historical, cultural

A–2 to express emotions and personal perspectives

Students will be able to:

A–2.1 share ideas, thoughts, opinions, preferences	a. inquire about and express agreement and disagreement, approval and disapproval, satisfaction and dissatisfaction, interest and lack of interest	a. inquire about, express and support opinions	a. react to the opinions of others
		b. express probability and certainty; e.g., *vielleicht, wahrscheinlich, bestimmt*	b. express, support and discuss own opinions
A–2.2 share emotions, feelings	a. inquire about, express and respond to emotions and feelings in a variety of contexts	a. discuss emotions and feelings in a variety of situations	a. compare the expression of emotions and feelings in a variety of situations

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General Outcome for Applications
Students will use German in a variety of **situations** and for a variety of **purposes**.

A–3 to get things done

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
A–3.1 guide actions of others	a. suggest a course of action in a variety of situations	a. give advice and warning	a. lodge a complaint
A–3.2 state personal actions	a. state personal actions in the past, present or future	a. express intention b. make a promise in a variety of situations	a. accept or decline an offer or invitation, with explanations
A–3.3 manage group actions	a. express disagreement in an appropriate way b. encourage other group members to participate	a. negotiate in a simple way with peers in small-group tasks	a. express appreciation, support and respect for contributions of others

A–4 to form, maintain and change interpersonal relationships

Students will be able to:

A–4.1 manage personal relationships	a. give and respond to compliments b. justify and explain own actions	a. offer and respond to congratulations b. express regret	a. initiate and participate in casual exchanges with others

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General Outcome for Applications
Students will use German in a variety of **situations** and for a variety of **purposes**.

A–5 to extend their knowledge of the world

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
A–5.1 discover and explore	a. explore and express meaning in a variety of ways; e.g., drawing a diagram, making a model, rephrasing	a. explore connections among and gain new insights into familiar topics	a. compare their own insights and understandings with those of classmates
A–5.2 gather and organize information	a. compose questions to guide research, and gather information using a prepared format; e.g., interview	a. organize and manipulate information; e.g., transform information from texts into other forms, such as tables or diagrams	a. identify key ideas, and summarize and paraphrase
A–5.3 explore opinions and values	a. examine differing perspectives on an issue b. make connections between behaviour and values	a. express positions on an issue, and provide supporting reasons	a. explore opinions and values related to specific situations; e.g., describe motivations of characters in literature b. explore how values influence behaviour
A–5.4 solve problems	a. identify a problem, and propose a solution	a. generate and evaluate alternative solutions to problems	a. use information collected from various sources to solve problems

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General Outcome for Applications
Students will use German in a variety of **situations** and for a variety of **purposes**.

A–6 for imaginative purposes and personal enjoyment

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
A–6.1 humour/fun	a. use German for fun and to interpret humour; e.g., cartoons, stories	a. use German for fun and to interpret and express humour; e.g., video clips, jokes	a. compare, contrast and appreciate differences in the interpretation and expression of humour in the German cultures and in own culture
A–6.2 creative/aesthetic purposes	a. use German creatively; e.g., write poems based on simple, repetitive and modelled language	a. use German creatively; e.g., experiment with the sounds and rhythms of German, create a poem or rap	a. use German creatively; e.g., write a story
A–6.3 personal enjoyment	a. use German for personal enjoyment; e.g., find a personal pen pal and exchange e-mail messages	a. use German for personal enjoyment; e.g., use the Internet to explore German cultures	a. use German for personal enjoyment; e.g., watch video clips, films or television programs

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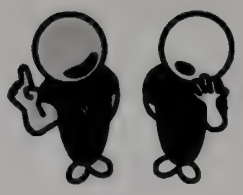
Language Competence



interpret and produce written texts, graphics and images

interpret and produce oral texts

attend to form

Students will understand and produce German effectively and competently in spoken and written forms.

apply knowledge of how discourse is organized, structured and sequenced in German

apply knowledge of the sociocultural context

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LANGUAGE COMPETENCE

Language competence is a broad term that includes linguistic or grammatical competence, discourse competence, sociolinguistic or sociocultural competence and what might be called textual competence. The specific outcomes under Language Competence deal with knowledge of the German language and the ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used. Language competence is best developed in the context of activities or tasks where the language is used for real purposes; in other words, in practical **applications**.

The various components of language competence are grouped under five cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of language competence. For example, under the cluster heading "attend to form," there is a strand for phonology (pronunciation, stress, intonation), orthography (spelling, mechanical features), lexicon (vocabulary words and phrases) and grammatical elements (syntax and morphology).

Although the outcomes isolate these individual aspects, language competence should be developed through classroom activities that focus on meaningful uses of the German language and on **language in context**. Tasks will be chosen based on the needs, interests and experiences of students. The vocabulary, grammar structures, text forms and social conventions necessary to carry out a task will be taught, practised and assessed as students are involved in various aspects of the task itself, **not in isolation**.

Strategic competence is often closely associated with language competence, since students need to learn ways to compensate for low proficiency in the early stages of learning if they are to engage in authentic language use from the beginning. This component is included in the language use strategies in the Strategies section.

Grammatical elements that appear only in the "in modelled situations" or "in structured situations" sections still need to be evaluated. It is understood that it may take students some time before they are able to use these elements independently and consistently. Evaluation practices should reflect the developmental nature of the learning process.

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–1 interpret and produce oral texts

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
LC–1.1 aural interpretation	a. understand the main points and some specific details of a variety of oral texts on familiar topics, in guided and unguided situations	a. understand short oral texts on a variety of topics	a. understand oral texts on a broad variety of topics
LC–1.2 oral production	a. produce simple oral texts on familiar topics, in guided and unguided situations	a. produce oral texts on familiar topics, in guided and unguided situations	a. produce a variety of oral texts, with guidance
LC–1.3 interactive fluency	a. initiate and manage short interactions, with pauses for planning and repair	a. initiate and manage simple interactions without undue difficulty, asking for repetition or clarification when necessary	a. engage, spontaneously, in routine and nonroutine interactions

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–2 interpret and produce written texts, graphics and images

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
LC–2.1 written interpretation	a. understand the main points and some specific details of a variety of written texts on familiar topics, in guided and unguided situations	a. understand short written texts on a variety of topics	a. understand written texts on a broad variety of topics
LC–2.2 written production	a. produce simple written texts on familiar topics, in guided and unguided situations	a. produce written texts on familiar topics, in guided and unguided situations	a. produce a variety of written texts, with guidance
LC–2.3 viewing	a. derive meaning from a variety of visuals and other forms of nonverbal communication, in guided situations	a. derive meaning from the visual elements of a variety of media, in guided situations	a. identify the purposes, intended audiences, messages and points of view in a variety of visual media, in guided and unguided situations
LC–2.4 representing	a. express meaning using a variety of visuals and other forms of nonverbal communication, in guided situations	a. express meaning using visual elements in a variety of media, in guided situations	a. communicate thoughts, ideas and feelings for specific purposes and audiences through a variety of visual media, in guided and unguided situations

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–3 attend to form

Students will be able to:

LC–3.1 phonology

German Language and Culture 10-6Y

a. pronounce unfamiliar words correctly

b. identify and reproduce some critical sound distinctions that are important for meaning; e.g., *Wien* vs. *Wein*

German Language and Culture 20-6Y

a. use intonation, stress and rhythm appropriately in familiar situations

German Language and Culture 30-6Y

a. use intonation, stress and rhythm appropriately in a variety of situations

LC–3.2 orthography

German Language and Culture 10-6Y

a. apply basic spelling rules consistently

b. use mechanical conventions; e.g., use of comma

German Language and Culture 20-6Y

a. apply spelling rules and mechanical conventions consistently and accurately

b. verify the spelling of unfamiliar words

German Language and Culture 30-6Y

a. apply spelling rules and mechanical conventions consistently and accurately

LC–3.3 lexicon

a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including:

Personal Relationships	**Personal Image**	**Health and Recreation**	**Popular Culture**
• friendship • character description • relationships	• personal style • fashion • careers • future plans	• sports and exercise • health and lifestyle • nutrition • environment	• music • mass media • advertising • literature
German Civilization	**European Context**	**Contemporary Life and Issues**	**Other Areas**
• history • famous people • literature • architecture • myths/legends	• geography/topography • travel • the European Union	• housing • institutions and systems (e.g., schools) • science and technology • current events	• any other lexical fields that meet the needs and interests of students

Note: Teachers may rearrange groupings and vary the emphasis on lexical fields to meet the needs and interests of students.

(continued)

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

(continued)

LC–3 attend to form

German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
Students will be able to:		
a. recognize and use, in modelled situations,[1] the following grammatical elements:		
• simple past • reflexive verbs (all forms) • nominative, accusative and dative case as a concept • sentence structure: time/manner/place • personal pronouns in dative • possessive pronouns preceding dative objects • adjectival endings • infinitive phrases and clauses (e.g., *Ich plane nach Deutschland zu reisen. Oma geht in die Stadt, um das Museum zu besuchen.*) • relative clauses in nominative and accusative	• sentence structure: position of subject and objects • genitive case as a concept • possessive pronouns in genitive • prepositions with genitive • relative clauses in dative and genitive	• sentence structure: subject–object inversion • *da* and *wo* compounds (e.g., *wofür, worauf*)

LC–3.4 grammatical elements

(continued)

1. Modelled Situations: This term is used to describe learning situations where a model of specific linguistic elements is consistently provided and immediately available. Students in such situations will have an emerging awareness of the linguistic elements and will be able to apply them in very limited situations. Limited fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

(continued)

LC–3 attend to form

German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y

Students will be able to:

b. use, in structured situations,[2] the following grammatical elements: .....

German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
• plural of nouns • separable verbs • perfect tense • modal verbs in simple past • future tense • personal pronouns in accusative • subordinate clauses • prepositions with accusative and dative • comparison of adjectives (all forms)	• simple past • reflexive verbs • nominative, accusative and dative case as a concept • sentence structure: time/manner/place • personal pronouns in dative • possessive pronouns preceding dative objects • prepositions with accusative and dative • adjectival endings • infinitive phrases and clauses • relative clauses in nominative and accusative	• reflexive verbs • sentence structure: position of subject and objects • genitive case as a concept • possessive pronouns in genitive • prepositions with genitive • adjectival endings • relative clauses in all cases

LC–3.4
grammatical elements

c. use, independently and consistently,[3] the following grammatical elements: .....

German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
• formal address • modal verbs in present tense • imperative mood (all forms) • possessive pronouns in nominative and accusative (plural) • comparison of adjectives (comparative forms only) • simple past (*hatte, war*)	• plural of nouns • separable verbs • perfect tense • modal verbs in simple past • future tense • personal pronouns in accusative • subordinate clauses • comparison of adjectives (all forms)	• simple past • nominative, accusative and dative case as a concept • sentence structure: time/manner/place • personal pronouns in dative • possessive pronouns preceding dative objects • prepositions with accusative and dative • infinitive phrases and clauses

2. Structured Situations: This term is used to describe learning situations where a familiar context for the use of specific linguistic elements is provided and students are guided in the use of these linguistic elements. Students in such situations will have increased awareness and emerging control of the linguistic elements and will be able to apply them in familiar contexts with teacher guidance. Student language is characterized by increasing fluency and confidence.
3. Independently and Consistently: This term is used to describe learning situations where students use specific linguistic elements in a variety of contexts with limited teacher guidance. Students in such situations will have consistent control of the linguistic elements and will be able to apply them in a variety of contexts with limited teacher guidance. Fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–4 apply knowledge of how discourse is organized, structured and sequenced in German

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
LC–4.1 text forms	a. identify and use a variety of oral and print text forms	a. use knowledge of text forms to enhance comprehension and production of texts	a. use a variety of familiar text forms and media in their own productions
LC–4.2 patterns of social interaction	a. initiate, respond to and close interactions, using a variety of social interaction patterns; e.g., agreement/disagreement – reaction, request – acceptance/nonacceptance	a. use a range of social interaction patterns to deal with routine interactions	a. use a range of social interaction patterns to deal with routine and some nonroutine interactions
LC–4.3 cohesion/coherence	a. link sentences, using basic connectors, in guided and unguided situations	a. understand and use referents within texts; e.g., *Opa liegt im Bett; er ist müde.*	a. organize texts to indicate logical progression; e.g., time sequencing, cause and effect, instructions b. use common writing conventions such as titles, subtitles and paragraphs

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General Outcome for Language Competence
Students will understand and produce German **effectively** and **competently** in spoken and written forms.

LC–5 apply knowledge of the sociocultural context

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
LC–5.1 register	a. recognize and use formal and informal language appropriately in familiar situations	a. recognize and use formal and informal language in a variety of contexts	a. explore formal and informal uses of language in a variety of contexts
LC–5.2 idiomatic expressions	a. use learned idiomatic expressions in a variety of contexts	a. use selected proverbs and sayings to enhance communication	a. identify unfamiliar idiomatic expressions in a variety of contexts b. explore and interpret idiomatic expressions in popular, contemporary culture
LC–5.3 variations in language	a. experience individual differences in spoken German; e.g., region, age, individual speech patterns	a. experience regional and other differences in German as spoken throughout the world	a. recognize and adapt to regional and other differences in German as spoken throughout the world
LC–5.4 social conventions	a. use basic forms and conventions of politeness b. use appropriate oral forms of address	a. interpret social conventions encountered in oral and written texts and situations	a. interpret and use social conventions in oral and written texts and situations
LC–5.5 nonverbal communication	a. understand and use some common nonverbal behaviours in familiar contexts; e.g., length of eye contact	a. understand and use some common nonverbal behaviours in a variety of contexts; e.g., norms of personal space	a. recognize nonverbal behaviours that are considered to be inappropriate in certain contexts

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Global Citizenship

historical and contemporary elements of the cultures of German-speaking peoples

affirming and valuing diversity

Students will acquire the knowledge, skills and attitudes to be effective global citizens, through the exploration of the cultures of the German-speaking world.

personal and career opportunities

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GLOBAL CITIZENSHIP

The learning outcomes for Global Citizenship deal with the development of intercultural competence, encompassing some of the knowledge, skills and attitudes that students need in order to be effective global citizens. The concept of global citizenship encompasses citizenship at all levels, from the local school and community to Canada and the world.

The various components of global citizenship are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of intercultural competence. For example, under the cluster heading "historical and contemporary elements of the cultures of German-speaking peoples," there are strands for gaining/applying knowledge of German cultures, diversity within German cultures, analyzing cultural knowledge and valuing German cultures.

Developing cultural knowledge and skills is a lifelong process. Knowledge of one's own culture is acquired over a lifetime. Cultures change over time. Within any national group, there may be a dominant culture or cultures and a number of additional cultures. Rather than developing a bank of knowledge about the German cultures, it is more important for students to develop skills in accessing and understanding information about cultures and in applying that knowledge for the purposes of interaction and communication. Students will gain cultural knowledge in the process of developing these skills. In this way, if they encounter elements of the German cultures they have not learned about in class, they will have the skills and abilities to deal with them effectively and appropriately.

The "affirming and valuing diversity" heading covers knowledge, skills and attitudes that are developed as a result of bringing other languages and cultures into relationship with one's own. There is a natural tendency when learning a new language and culture to compare it with what is familiar. Many students leave a second language learning experience with a heightened awareness and knowledge of their own language and culture. They will also be able to make some generalizations about languages and cultures based on their experiences and those of their classmates, who may have a variety of cultural backgrounds. This will provide students with an understanding of diversity within both a global and a Canadian context.

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

GC–1 historical and contemporary elements of the cultures of German-speaking peoples

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
GC–1.1 gaining/applying knowledge of German cultures	a. explore and identify some social aspects of German life; e.g., festivals, sports and communities b. apply knowledge of German cultures to interpret behaviour that is different from their own; e.g., use of public transportation, involvement in part-time jobs	a. explore and identify some important aspects of German imagination; e.g., fairy tales, stories, movies	a. explore and identify some important aspects of German culture and history; e.g., key events and their lasting impact
GC–1.2 diversity within German cultures	a. recognize the ethnic diversity and multicultural nature of German-speaking countries	a. recognize the existence of stereotypes about and within German cultures	a. recognize and explore the impact of diversity on contemporary German-speaking communities
GC–1.3 analyzing cultural knowledge	a. use basic research skills to find out about German cultures b. explore some common stereotypes of German cultures, and explore their origins	a. identify and use a variety of sources of information to find out about German cultures b. analyze own assumptions about German cultures	a. organize and present information about elements of German cultures in a variety of ways
GC–1.4 valuing German cultures	a. identify some contributions of German cultures to global society	a. recognize and describe some contributions of German cultures to global society and to their own society	a. seek out and use opportunities to interact with German-speaking people in the community and throughout the world

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

GC–2 affirming and valuing diversity

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
GC–2.1 awareness of English	a. identify some English words that have been adopted from German (e.g., angst), and identify some German words that have been adopted from English (e.g., *Handy*)	a. recognize the existence of cognates whose meanings vary in English and German (false friends); e.g., to become/*bekommen*	a. analyze the ways that English and German are significantly different and the ways that they are the same
GC–2.2 general language knowledge	a. identify regional and/or social differences in pronunciation and vocabulary in various languages within their personal experience	a. identify how and why languages borrow from one another	a. recognize that languages and their status evolve/change over time
GC–2.3 awareness of Canadian culture	a. use new understanding of German cultures to reflect on and clarify aspects of Canadian culture	a. identify shared references and significant events that have had an impact on both Canadian and German cultures	a. recognize ethnocentric perspectives in Canadian and German texts
GC–2.4 general cultural knowledge	a. recognize that people of a specific culture may have perspectives that differ from those of people in other cultures b. identify the limitations of adopting a single perspective	a. recognize that communication can be affected by different cultural practices; e.g., gestures, perspectives and values b. explore and seek out information about other cultures through the medium of German	a. recognize that different cultures may have different interpretations of texts, cultural practices or products
GC–2.5 intercultural skills	a. apply interpersonal skills to cope with linguistically and culturally unfamiliar situations	a. explore various strategies for enhancing communication with people from German cultures	a. identify and use a variety of strategies for enhancing relations with people from different cultures

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the German-speaking world.

GC–3 personal and career opportunities

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
GC–3.1 German language and culture	a. identify some personal uses they have made of their knowledge of German language and culture	a. explore opportunities for further studies or careers related to German	a. identify aspects of German culture that are of personal interest; e.g., history, literature
GC–3.2 cultural and linguistic diversity	a. identify some careers for which knowledge of different languages and cultures is useful	a. identify some countries where there is significant linguistic and cultural diversity	a. identify aspects of the history, literature, arts and crafts of different cultures that are of personal interest b. identify some careers that use knowledge of international languages and cultures, and intercultural skills

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Strategies

language learning

language use

Students will know and use various strategies to maximize the effectiveness of learning and communication.

general learning

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STRATEGIES

Under the Strategies heading are specific outcomes that will help students learn and communicate more **effectively**. Strategic competence has long been recognized as an important component of communicative competence. The learning outcomes that follow deal not only with compensation and repair strategies, important in the early stages of language learning when proficiency is low, but with strategies for language learning, language use in a broader sense, as well as general learning strategies that help students acquire content. Although people may use strategies unconsciously, the learning outcomes deal only with the **conscious use** of strategies.

The strategies are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands that show the development of awareness and skill in using strategies from course to course. Each strand, identified by a strand heading at the left end of the row, deals with a specific category of strategy. Language learning and general learning strategies are categorized as cognitive, metacognitive and social/affective. The language use strategies are organized by communicative mode: receptive, productive, interactive.

The strategies that students choose depend on the task they are engaged in as well as on other factors, such as their preferred learning style, personality, age, attitude and cultural background. Strategies that work well for one person may not be effective for another person, or may not be suitable in a different situation. For this reason it is not particularly useful to say that students should be aware of, or able to use, a specific strategy at a particular grade level. Consequently, the specific outcomes describe the students' knowledge of, and ability to use, general types of strategies. More specific strategies for each general category or type are included in the sample list of strategies below. The specific strategies provided in the sample list **are not prescriptive** but are provided as an illustration of how the general strategies in the specific outcomes might be developed.

Teachers need to know and be able to demonstrate a broad range of strategies from which students are then able to choose in order to communicate effectively. Strategies of all kinds are best taught in the context of learning activities where students can apply them immediately and then reflect on their use.

SAMPLE LIST OF STRATEGIES

Language Learning Strategies

Cognitive

- listen attentively
- perform actions to match words of a song, story or rhyme
- learn short rhymes or songs, incorporating new vocabulary or sentence patterns
- imitate sounds and intonation patterns
- memorize new words by repeating them silently or aloud
- seek the precise term to express meaning
- repeat words or phrases in the course of performing a language task
- make personal dictionaries
- experiment with various elements of the language
- use mental images to remember new information
- group together sets of things—vocabulary, structures—with similar characteristics
- identify similarities and differences between aspects of the German language and own language
- look for patterns and relationships
- use previously acquired knowledge to facilitate a learning task
- associate new words or expressions with familiar ones, either in German or in own language
- find information, using reference materials like dictionaries, textbooks and grammars
- use available technological aids to support language learning; e.g., cassette recorders, computers
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember

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- place new words or expressions in a context to make them easier to remember
- use induction to generate rules governing language use
- seek opportunities outside of class to practise and observe
- perceive and note down unknown words and expressions, noting also their context and function

Metacognitive
- check copied writing for accuracy
- make choices about how you learn
- rehearse or role-play language
- decide in advance to attend to the learning task
- reflect on learning tasks with the guidance of the teacher
- make a plan in advance about how to approach a language learning task
- reflect on the listening, reading and writing process
- decide in advance to attend to specific aspects of input
- listen or read for key words
- evaluate own performance or comprehension at the end of a task
- keep a learning log
- experience various methods of language acquisition, and identify one or more considered to be particularly useful personally
- be aware of the potential of learning through direct exposure to the language
- know how strategies may enable coping with texts containing unknown elements
- identify problems that might hinder successful completion of a task, and seek solutions
- monitor own speech and writing to check for persistent errors
- be aware of own strengths and weaknesses, identify own needs and goals, and organize strategies and procedures accordingly

Social/Affective
- initiate or maintain interaction with others
- participate in shared reading experiences
- seek the assistance of a friend to interpret a text
- reread familiar self-chosen texts to enhance understanding and enjoyment
- work cooperatively with peers in small groups
- understand that making mistakes is a natural part of language learning
- experiment with various forms of expression, and note their acceptance or nonacceptance by more experienced speakers
- participate actively in brainstorming and conferencing as prewriting and postwriting exercises
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- repeat new words and expressions occurring in own conversations, and make use of these new words and expressions as soon as appropriate
- reduce anxiety by using mental techniques, such as positive self-talk or humour
- work with others to solve problems, and get feedback on tasks
- provide personal motivation by arranging own rewards when successful

Language Use Strategies

Receptive
- determine the purpose of listening
- assess own information needs before listening, viewing or reading
- prepare questions or a guide to note down information found in the text
- make predictions about what you expect to hear or read based on prior knowledge and personal experience
- listen selectively based on purpose
- listen or look for key words
- use key content words or discourse markers to follow an extended text
- use skimming and scanning to locate key information in texts
- use illustrations to aid reading comprehension
- infer probable meanings of unknown words or expressions from contextual clues
- use knowledge of the sound–symbol system to aid reading comprehension
- reread several times to understand complex ideas
- observe gestures, intonation and visual supports to aid comprehension
- summarize information gathered

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- make connections between texts on the one hand and prior knowledge and personal experience on the other

Productive
- mimic what the teacher says
- use nonverbal means to communicate
- copy what others say or write
- use words visible in the immediate environment
- be aware of and use the steps of the writing process: prewriting (gathering ideas, planning the text, research, organizing the text), writing, revision (rereading, moving pieces of text, rewriting pieces of text), correction (grammar, spelling, punctuation), publication (reprinting, adding illustrations, binding)
- use various techniques to explore ideas at the planning stage, such as brainstorming or keeping a notebook or log of ideas
- use familiar repetitive patterns from stories, songs, rhymes or media
- use illustrations to provide detail when producing own texts
- use familiar sentence patterns to form new sentences
- take notes when reading or listening to assist in producing own text
- compensate for avoiding difficult structures by rephrasing
- use resources to increase vocabulary
- use descriptions, explanations or various words and phrases to compensate for lack of specific terms (circumlocution)
- use a variety of resources to correct texts; e.g., personal and commercial dictionaries, checklists, grammars
- apply grammar rules to improve accuracy at the correction stage
- revise and correct final version of text

Interactive
- indicate lack of understanding verbally or nonverbally; e.g., *Entschuldigung, Wie bitte?, Das habe ich nicht verstanden*, raised eyebrows, blank look
- interpret and use a variety of nonverbal cues to communicate; e.g., mime, pointing, gestures, drawing pictures
- ask for clarification or repetition when you do not understand; e.g., *Was meinen Sie damit? Wiederholen Sie, bitte!*
- ask for confirmation that a form used is correct; e.g., *Kann man das sagen? Wie heißt das auf Deutsch?*
- use other speakers' words in subsequent conversations
- use descriptions, explanations or various words and phrases to compensate for lack of specific terms (circumlocution)
- assess feedback from a conversation partner to recognize if a message has been understood
- start again, using a different tactic, when communication breaks down
- use fillers, hesitation devices and gambits to sustain conversations; e.g., *Na ja, gut, nicht wahr*

General Learning Strategies

Cognitive
- classify objects and ideas according to their attributes; e.g., red objects and blue objects, or animals that eat meat and animals that eat plants
- use models
- connect what is already known with what is being learned
- experiment with and concentrate on one thing at a time
- focus on and complete learning tasks
- record key words and concepts in abbreviated form—verbal, graphic or numerical—to assist with performance of a learning task
- use mental images to remember new information
- distinguish between fact and opinion when using a variety of sources of information
- formulate key questions to guide research
- make inferences, and identify and justify the evidence on which these inferences are based
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember
- seek information through a network of sources, including libraries, the Internet, individuals and agencies

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- use previously acquired knowledge or skills to assist with a new learning task

Metacognitive

- reflect on learning tasks with the guidance of the teacher
- choose from various study techniques
- discover how own efforts can affect learning
- reflect upon own thinking processes and how you learn
- decide in advance to attend to the learning task
- divide an overall learning task into a number of subtasks
- make a plan in advance about how to approach a task
- identify own needs and interests
- manage own physical working environment
- keep a learning journal, such as a diary or a log
- develop criteria for evaluating own work
- work with others to monitor own learning
- take responsibility for planning, monitoring and evaluating learning experiences

Social/Affective

- watch others' actions and copy them
- seek help from others
- follow own natural curiosity and intrinsic motivation to learn
- participate in cooperative group learning tasks
- choose learning activities that enhance understanding and enjoyment
- be encouraged to try, even though mistakes may be made
- take part in group decision-making processes
- use support strategies to help peers persevere at learning tasks; e.g., offer encouragement, praise, ideas
- take part in group problem-solving processes
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- monitor own level of anxiety about learning tasks, and take measures to lower it if necessary; e.g., deep breathing, laughter
- use social interaction skills to enhance group learning activities

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
S–1.1 cognitive	a. identify and use a variety of cognitive strategies to enhance language learning; e.g., find and apply information, using reference materials like dictionaries, textbooks and grammars	a. select and use a variety of cognitive strategies to enhance language learning; e.g., seek the precise term, look for patterns and relationships	a. select and use appropriate cognitive strategies to enhance language learning in a variety of situations; e.g., use word maps or other graphic representations
S–1.2 metacognitive	a. identify and use a variety of metacognitive strategies to enhance language learning; e.g., make a plan in advance about how to approach a language learning task	a. select and use a variety of metacognitive strategies to enhance language learning; e.g., evaluate own performance or comprehension at the end of a task	a. select and use appropriate metacognitive strategies to enhance language learning; e.g., monitor own speech and writing to check for persistent errors, evaluate own performance
S–1.3 social/affective	a. identify and use a variety of social and affective strategies to enhance language learning; e.g., work cooperatively with peers in small groups	a. select and use a variety of social and affective strategies to enhance language learning; e.g., brainstorm, reread familiar self-chosen texts	a. select and use appropriate social and affective strategies to enhance language learning; e.g., experiment with various forms of expression

Further examples of language learning strategies are available on pages 30 and 31.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–2 language use

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
S–2.1 receptive	a. identify and use a variety of reading and listening strategies; e.g., make inferences based on contextual clues	a. select and use a variety of reading and listening strategies; e.g., skimming, scanning, rereading	a. select and use appropriate reading and listening strategies; e.g., use key content words or discourse markers to follow an extended text
S–2.2 productive	a. identify and use a variety of speaking and writing strategies; e.g., apply grammar rules to improve accuracy	a. select and use a variety of speaking and writing strategies; e.g., use a variety of resources to correct texts	a. select and use appropriate speaking and writing strategies; e.g., experiment with multiple ways of expressing meaning
S–2.3 interactive	a. identify and use a variety of interactive strategies; e.g., ask for clarification, use other speakers' words	a. select and use a variety of interactive strategies; e.g., start again, using a different tactic, when communication breaks down	a. select and use appropriate interactive strategies; e.g., use fillers, hesitation devices and gambits, sustain conversations by requesting further details

Further examples of language use strategies are available on pages 31 and 32.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–3 general learning

	German Language and Culture 10-6Y	German Language and Culture 20-6Y	German Language and Culture 30-6Y
	Students will be able to:		
S–3.1 cognitive	a. identify and use a variety of cognitive strategies to enhance general learning; e.g., look for patterns and relationships	a. select and use a variety of cognitive strategies to enhance general learning; e.g., formulate key questions to guide inquiry	a. select and use appropriate cognitive strategies to enhance general learning; e.g., seek information using a variety of sources
S–3.2 metacognitive	a. identify and use a variety of metacognitive strategies to enhance general learning; e.g., identify own needs and interests	a. select and use a variety of metacognitive strategies to enhance general learning; e.g., reflect upon own thinking processes and how they learn	a. select and use appropriate metacognitive strategies to enhance general learning; e.g., take responsibility for planning, monitoring and evaluating learning experiences
S–3.3 social/affective	a. identify and use a variety of social and affective strategies to enhance general learning; e.g., use support strategies to help peers persevere at learning tasks	a. select and use a variety of social and affective strategies to enhance general learning; e.g., take part in group problem-solving processes	a. select and use appropriate social and affective strategies to enhance general learning; e.g., take risks, try unfamiliar tasks and approaches

Further examples of general learning strategies are available on pages 32 and 33.

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ITALIAN LANGUAGE AND CULTURE 10-3Y, 20-3Y, 30-3Y

This Italian Language and Culture Three-year (3Y) Program is intended for students who are beginning their study of Italian language and culture in senior high school.

INTRODUCTION

Global Citizenship

Preparing youth to meet the challenges of the new millennium, in a world that is increasingly interdependent, is one of the more important objectives of language education.

Globalization and our multicultural society have increased the need for knowledge of other languages and cultures for effective communication, for better human relations within our own diverse Canadian society, and for a competitive edge in the shrinking world of economics.

Through the study of languages, students learn to recognize, respect and appreciate the cultural diversity of Canadian society and the countries of the world.

Learning Italian, just as learning any other language, develops thinking skills and learning strategies that are transferable to other learning situations.

Knowledge of Italian is helpful for understanding the development of European culture. The study of Italian also develops awareness of, and sensitivity to, the cultural and linguistic diversity of Canadian society.

A Means of Communication

Communication is the fundamental basis for human relationships. Italian is learned to enable communication with Italian speakers, but it is also useful in many fields of endeavour, including the study of bel canto; classical music; cultural, historical and scientific research; and travelling. Italy, as a modern industrialized country, attracts millions of people from every corner of the globe to its shores for many reasons.

Millions of Italians have migrated to many countries, including Canada, in the last two centuries. Language and culture have been retained wherever Italians have settled. Toronto, Montreal, New York and Melbourne are a few examples of cities where Italian culture has flourished and where language has been retained.

Personal and Cognitive Benefits

There is plenty of evidence to suggest that learning another language contributes to the development of first language skills and enhances not only vocabulary but improves cognitive functioning. Learning a second language increases the ability to conceptualize and to think abstractly; and it fosters more cognitive flexibility, greater divergent thinking, creativity and metalinguistic competence.

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Maintaining Language Skills and Cultural Connections

For those students who already have some knowledge of Italian or a family connection to the culture, there is the opportunity to renew contact with the language, culture and heritage.

Economic Benefits

In today's world, knowledge of another language and culture in general, and Italian language and culture in particular, is very valuable. It can open the door to exciting career opportunities in almost every kind of business, industry and profession. Indeed, the knowledge of another language and culture enables people to communicate and interact effectively in the global marketplace and workplace.

ASSUMPTIONS

The following statements are assumptions that have guided the development process of this program of studies.

- Language is communication.
- All students can be successful learners of language and culture, although they will learn in a variety of ways and acquire proficiency at varied rates.
- All languages can be taught and learned.
- Learning Italian as a second language leads to enhanced learning in both the student's primary language and in related areas of cognitive development and knowledge acquisition. This is true of students who come to the class with some background knowledge of Italian and develop literacy skills in the language. It is also true for students who have no cultural or linguistic background in Italian and are studying Italian as a second language.

THE CONCEPTUAL MODEL

The aim of this program of studies is the development of communicative competence in Italian.

Four Components

For the purposes of this program of studies, communicative competence is represented by four interrelated and interdependent components.

Applications deal with what the students will be able to do with the language, the functions they will be able to perform and the contexts in which they will be able to operate.

Language Competence addresses the students' knowledge of the language and their ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used.

Global Citizenship aims to develop intercultural competence, with a particular focus on cultures of the Italian-speaking world.

Strategies help students learn and communicate more effectively and more efficiently.

Each of these components is described more fully at the beginning of the corresponding section of this program of studies.

Modes of Communication

Because of the focus on using language to communicate in specific contexts, with a particular purpose or task in mind, three modes of communication are used to organize some of the specific outcomes.

Interaction is most often direct, face-to-face oral communication, but it can take the form of written communication between individuals, using a medium such as e-mail where the exchange of information is fairly immediate. It is characterized principally by the opportunity to actively negotiate meaning; that is, helping others understand and working to understand others. Interactive communication generally requires more speed but less accuracy than the other two modes.

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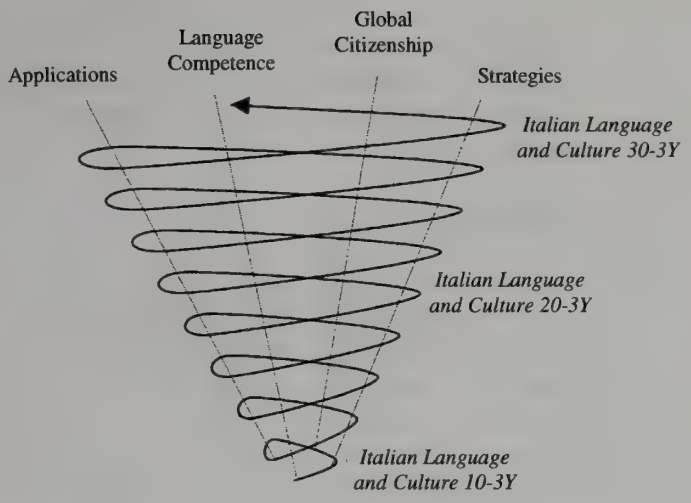
Interpretation is receptive communication of oral and written messages in contexts where the listener or reader is not in direct contact with the creator of the message. While there is no opportunity to ask for clarification, there is sometimes the possibility of rereading or listening again, consulting references, or making the meaning clearer in other ways. Reading and listening will sometimes involve **viewing** and interpreting visual elements, such as illustrations in books or moving images in television and film. Interpretation goes beyond a literal comprehension to include an understanding of some of the unspoken or unwritten meaning intended by the speaker or author.

Production is communication of oral and written messages in contexts where the audience is not in personal contact with the speaker or writer, or in situations of one-to-many communication; e.g., a lecture or a performance where there is no opportunity for the listener to interact with the speaker. Oral and written presentations will sometimes be enhanced by **representing** the meaning visually, using pictures, diagrams, models, drama techniques or other nonverbal forms of communication. Greater knowledge of the language and culture is required to ensure that communication is successful, since the participants cannot directly negotiate meaning.

A Spiral Progression

Language learning is integrative, not merely cumulative. Each new element that is added must be integrated into the whole of what has gone before. The model that best represents the students' language learning progress is an expanding spiral. Their progression is not only vertical (e.g., increased proficiency) but also horizontal (e.g., broader range of applications and experience with more text forms, contexts and so on). The spiral also represents how language learning activities are best structured. Particular lexical fields, learning strategies or language functions, for example, are revisited at different points in the program, but from a different perspective, in broader contexts or at a slightly higher level of proficiency each time. Learning is reinforced, extended and broadened with each successive pass.



ORGANIZATION OF THE PROGRAM OF STUDIES

General Outcomes

General outcomes are broad statements identifying the knowledge, skills and attitudes that students are expected to achieve in the course of their language learning experience. The four general outcomes serve as the foundation for this program of studies and are based on the conceptual model outlined above.

Applications [A]

- Students will use Italian in a variety of **situations** and for a variety of **purposes**.

Language Competence [LC]

- Students will use Italian **effectively** and **competently**.

Global Citizenship [GC]

- Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

Strategies [S]

- Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

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The order in which the general outcomes are presented in the program of studies does not represent a sequential order, nor does it indicate the relative importance of each component. The general outcomes are to be implemented in an integrated manner.

Specific Outcomes

Each general outcome is further broken down into specific outcomes that students are to achieve by the end of each course. The specific outcomes are interrelated and interdependent. In most classroom activities, a number of learning outcomes will be dealt with in an integrated manner.

The specific outcomes are categorized under cluster headings, which show the scope of each of the four general outcomes. These headings are shown in the table on the following page.

The specific outcomes are further categorized by strands, which show the developmental flow of learning from the beginning to the end of the program. However, an outcome for a particular course will not be dealt with only in that particular year of the program. The spiral progression that is part of the conceptual model means that activities in the years preceding will prepare the ground for acquisition and in the years following will broaden applications.

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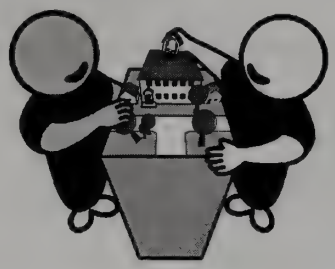
General Outcomes

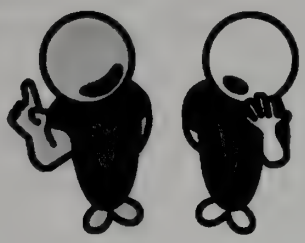
Applications



Students will use Italian in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information
A–2 to express emotions and personal perspectives
A–3 to get things done
A–4 to extend their knowledge of the world
A–5 for imaginative purposes and personal enjoyment
A–6 to form, maintain and change interpersonal relationships

Language Competence



Students will use Italian **effectively** and **competently**.

LC–1 attend to form
LC–2 interpret and produce oral and written texts
LC–3 apply knowledge of the sociocultural context
LC–4 apply knowledge of how the Italian language is organized, structured and sequenced

Global Citizenship

Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

GC–1 historical and contemporary elements of Italian-speaking cultures
GC–2 affirming and valuing diversity
GC–3 personal and career opportunities

Strategies

Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning
S–2 language use
S–3 general learning

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Guide to Reading the Program of Studies

General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

cluster heading for specific outcomes

S–2 language use

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
S–2.1 interactive	a. use simple interactive strategies with guidance; e.g., indicate lack of understanding verbally or nonverbally	a. identify and use a variety of interactive strategies; e.g., use different techniques to maintain communication	a. select and use a variety of interactive strategies; e.g., use a range of communicative devices to sustain conversations
S–2.2 interpretive	a. use simple interpretive strategies with guidance; e.g., use illustrations, gestures and intonation to aid comprehension	a. identify and use a variety of interpretive strategies; e.g., seek key words and expressions, make inferences based on prior knowledge	a. select and use a variety of interpretive strategies; e.g., prepare questions or a guide to facilitate comprehension
S–2.3 productive	a. use simple productive strategies with guidance; e.g., use words in the immediate environment	a. identify and use a variety of productive strategies; e.g., use knowledge of sentence patterns to form new sentences	a. select and use a variety of productive strategies; e.g., use a variety of resources to sustain and enrich communication

read each page vertically for outcomes expected at the end of each course

strand headings for specific outcomes

specific outcome statements for each course

read each page horizontally for developmental flow of outcomes from course to course

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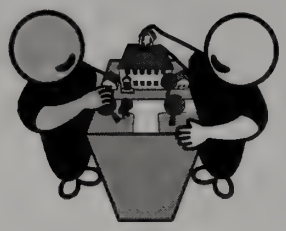

Applications

to express emotions and personal perspectives

to receive and impart information

to get things done

Students will use Italian in a variety of situations and for a variety of purposes.

to form, maintain and change interpersonal relationships

for imaginative purposes and personal enjoyment

to extend their knowledge of the world

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APPLICATIONS

The specific outcomes under the heading Applications deal with **what** the students will be able to do with the Italian language; that is, the **functions** they will be able to perform and the **contexts** in which they will be able to operate.

The functions are grouped under six cluster headings—see the illustration on the preceding page. Under each of these headings there are one or more strands, which show the developmental flow of learning from course to course. Each strand, identified by a strand heading at the left end of a row, deals with a specific language function; e.g., share factual information. Students at any level will be able to share factual information. Beginning learners will do this in very simple ways. As students gain more knowledge and experience, they will broaden the range of subjects they can deal with, they will learn to share information in writing as well as orally, and they will be able to handle formal and informal situations.

Different models of communicative competence have organized language functions in a variety of ways. The organizational structure chosen here reflects the needs and interests of students in a classroom where activities are focused on meaning and are interactive. For example, the strand entitled "manage group actions" has been included to ensure that students acquire the language necessary to function independently in small groups, since this is an effective way of organizing second language classrooms. The strands under the cluster heading "to extend their knowledge of the world" will accommodate a content-based approach to language learning where students learn content from another subject area as they learn the Italian language.

The level of linguistic, sociolinguistic and discourse competence that students will exhibit when carrying out the functions is defined in the specific outcomes for Language Competence for each course. To know how well students will be able to perform the specific function, the Applications outcomes must be read in conjunction with the Language Competence outcomes.

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General Outcome for Applications
Students will use Italian in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
A–1.1 share factual information	a. identify people, places and things b. ask for and provide basic information c. respond to simple questions	a. ask for and provide information on various familiar topics b. describe people, places, things and series of events or actions	a. provide information on several aspects of a topic; e.g., give a simple report including descriptions and comparisons

A–2 to express emotions and personal perspectives

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
A–2.1 share ideas, thoughts, opinions, preferences	a. express a personal response and simple preferences b. identify favourite people, places, things and activities	a. express a personal response to a variety of situations b. inquire about and express likes and dislikes c. record and share thoughts and ideas with others	a. inquire about and express reasons and preferences
A–2.2 share emotions, feelings	a. respond to and express emotions and feelings b. identify emotions and feelings	a. inquire about, express and respond to a variety of emotions and feelings b. record and share personal experiences involving an emotion or feeling	a. inquire about and express emotions and feelings in a variety of familiar contexts b. compare the expression of emotions and feelings in a variety of informal situations

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General Outcome for Applications
Students will use Italian in a variety of **situations** and for a variety of **purposes**.

A–3 to get things done

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
A–3.1 guide actions of others	a. indicate basic needs and wants b. give and respond to simple oral instructions or commands c. suggest a course of action, and respond to a suggestion	a. make and respond to a variety of simple requests b. seek, grant or withhold permission c. relay simple messages d. give and follow a simple sequence of instructions	a. make and respond to suggestions in a variety of situations b. give and respond to advice and warnings c. encourage others to perform an action, or discourage others from a course of action
A–3.2 state personal actions	a. respond to offers, invitations and instructions b. ask or offer to do something c. state preference from among several options	a. express a wish or a desire to do something b. make an offer or an invitation, and respond to offers and invitations made by others c. inquire about and express ability and inability to do something	a. state personal actions in the past, present or future b. make a promise and express intention in a variety of situations
A–3.3 manage group actions	a. manage turn taking b. encourage other group members to act appropriately c. ask for help or for clarification of what is being said or done in the group	a. suggest, initiate or direct action in group activities b. encourage other group members to participate c. assume a variety of roles and responsibilities as group members d. negotiate in a simple way with peers in small-group tasks e. offer to explain or clarify	a. check for agreement and understanding b. express disagreement in an appropriate way c. express appreciation, enthusiasm, support and respect for contributions of others

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General Outcome for Applications
Students will use Italian in a variety of **situations** and for a variety of **purposes.**

A–4 to extend their knowledge of the world

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
A–4.1 discover and explore	a. discover and explore the immediate environment	a. make and talk about personal observations b. explore classification systems and criteria for categories c. discover relationships and patterns	a. ask questions to gain knowledge and clarify understanding b. explore meaning in a variety of ways; e.g., by drawing a diagram, making a model, rephrasing
A–4.2 gather and organize information	a. gather simple information b. organize and sequence items in different ways c. sequence items in different ways	a. record and share personal knowledge of a topic b. compare and contrast items in simple ways c. compose questions to guide research d. identify sources of information e. record observations	a. gather information from a variety of resources b. organize and manipulate information; e.g., transform information from texts into other forms, such as tables, diagrams, story maps, flow charts
A–4.3 solve problems	a. experience problem-solving situations in the classroom b. choose between alternative solutions	a. recognize and describe a problem, then propose simple solutions b. understand and use the steps in the problem-solving process	a. describe and analyze a problem, then propose a variety of solutions b. generate and evaluate alternative solutions to problems
A–4.4 explore opinions and values	a. listen attentively to the opinions expressed b. respond sensitively to the ideas and products of others c. make connections between simple behaviour and values; e.g., *Lei studia tanto. È studiosa.*	a. express their views on a variety of topics within their direct experience b. gather opinions on a topic within their direct experience c. recognize differences of opinion	a. explore how values influence behaviour; e.g., describe characters and their motivations in a story b. provide reasons for their position on an issue

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General Outcome for Applications
Students will use Italian in a variety of **situations** and for a variety of **purposes**.

A–5 for imaginative purposes and personal enjoyment

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
A–5.1 humour/fun	a. use Italian for fun; e.g., learn simple riddles, jingles and humorous songs	a. use Italian for fun and to interpret humour; e.g., simple, amusing texts	a. use Italian for fun and to interpret and express humour; e.g., interpret figures of speech literally, using illustrations or short skits
A–5.2 creative/aesthetic purposes	a. use Italian creatively; e.g., write slogans	a. use Italian creatively and for aesthetic purposes; e.g., write poems based on simple, repetitive and modelled language	a. use Italian creatively and for aesthetic purposes; e.g., create travel brochures, advertisements
A–5.3 personal enjoyment	a. use Italian for personal enjoyment; e.g., use audiovisual materials	a. use Italian for personal enjoyment; e.g., listen to favourite songs in Italian, play games	a. use Italian for personal enjoyment; e.g., exchange letters with, or e-mail, a pen pal

A–6 to form, maintain and change interpersonal relationships

	Students will be able to:		
A–6.1 manage personal relationships	a. exchange greetings and farewells b. address a new acquaintance, and introduce themselves c. exchange some basic personal information; e.g., name, age d. initiate relationships	a. apologize and refuse politely b. talk about themselves, and respond to the talk of others by showing attention and interest c. make and break social engagements	a. initiate and participate in casual exchanges with classmates b. use routine means of interpersonal communications; e.g., telephone calls, personal notes, e-mail messages

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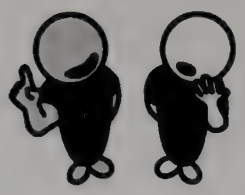
Language Competence



interpret and produce oral and written texts

attend to form

Students will use Italian effectively and competently.

apply knowledge of how the Italian language is organized, structured and sequenced

apply knowledge of the sociocultural context

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LANGUAGE COMPETENCE

Language competence is a broad term that includes linguistic or grammatical competence, discourse competence, sociolinguistic or sociocultural competence, and what might be called textual competence. The specific outcomes under Language Competence deal with knowledge of the language and the ability to use that knowledge to interpret and produce meaningful texts appropriate to the situation in which they are used. Language competence is best developed in the context of activities or tasks where the language is used for real purposes; in other words, in practical **applications**.

The various components of language competence are grouped under four cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of language competence. For example, under the cluster heading "attend to form," there is a strand for phonology (pronunciation, stress, intonation), orthography (spelling, mechanical features), lexicon (vocabulary words and phrases) and grammatical elements (syntax and morphology).

Although the outcomes isolate these individual aspects, language competence should be developed through classroom activities that focus on meaningful uses of the language and on **language in context**. Tasks will be chosen based on the needs, interests and experiences of students. The vocabulary, grammar structures, text forms and social conventions necessary to carry out a task will be taught, practised and assessed as students are involved in various aspects of the task itself, **not in isolation**.

Strategic competence is often closely associated with language competence, since students need to learn ways to compensate for low proficiency in the early stages of learning if they are to engage in authentic language use from the beginning. This component is included in the language use strategies in the Strategies section.

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

LC–1 attend to form

	Italian Language and Culture 10-3Y *Students will be able to:*	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
LC–1.1 phonology	a. pronounce some common words and phrases comprehensibly b. use intonation to express meaning c. distinguish particular sounds of the Italian language	a. use comprehensible pronunciation, stress and intonation when producing familiar words or phrases b. recognize some of the effects that intonation and stress have in different situations	a. pronounce unfamiliar words b. identify and reproduce sound distinctions that are important for meaning
LC–1.2 orthography	a. recognize and name basic elements of the writing system b. write words of personal significance	a. recognize and use basic spelling patterns b. recognize and use basic mechanical conventions; e.g., capitalization, punctuation	a. apply some common spelling rules b. use basic spelling patterns consistently in writing familiar words and phrases
LC–1.3 lexicon	a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including: • school • activities • time and weather • people around me • holidays and celebrations • shopping and restaurants • any other lexical fields that meet their needs and interests	a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including: • daily routine • clothing • travel • food • health • sports • any other lexical fields that meet their needs and interests	a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including: • arts, entertainment and literature • the world of work • technology • the environment • social issues • any other lexical fields that meet their needs and interests b. recognize that one word may have multiple meanings, depending on the context, and that various words and expressions may express the same idea

(continued)

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

(continued)

LC–1 attend to form

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
a.	use, in modelled situations,[1] the following grammatical elements:		

LC–1.4 grammatical elements

Verbs:
- present perfect of verbs in *-are, -ere, -ire*; e.g., *ho studiato, ho letto, ho dormito; sono andato/sono andata*
- present tense of modal verbs: *potere, volere, dovere*
- present conditional of verbs in *-are, -ere, -ire*

Prepositions:
- simple: *di, a, da, in, con, su, per, tra, fra*
- compound; e.g., *del, dello, dell', della, dei, degli, delle*

Pronouns:
- indirect object: *le, gli, loro*

Negative Expressions:
- e.g., *non* (verb) *più*
  non (verb) *ancora*
  non (verb) *mai*
  non (verb) *niente*

(continued)

1. Modelled Situations: This term is used to describe learning situations where a model of specific linguistic elements is consistently provided and immediately available. Students in such situations will have an emerging awareness of the linguistic elements and will be able to apply them in very limited situations. Limited fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

(continued)

LC–1 attend to form

Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y

Students will be able to:

b. use, in structured situations,[2] the following grammatical elements: .....

LC–1.4 grammatical elements

Articles:
- partitive: *del, dello, dell', della, dei, degli, delle*

Verbs:
- future of verbs in *-are, -ere, -ire*
- reflexive; e.g., *mi lavo, mi siedo, mi vesto*

Pronouns:
- direct object: *lo, li, la, le*

Pronouns:
- indirect object: *le, gli, loro*
- possessive; e.g., *il mio, il tuo, il suo*

Verbs:
- imperfect of verbs in *-are, -ere, -ire*
- present perfect of verbs in *-are, -ere, -ire*
- present tense of modal verbs: *potere, volere, dovere*
- present conditional of verbs in *-are, -ere, -ire*

Adjectives:
- relative superlative: *il più* (adjective) *di, la più* (adjective) *di*

Adverbs:
- adjective with *-mente;* e.g., *lentamente, facilmente, caramente*

Prepositions:
- simple: *di, a, da, in, con, su, per, tra, fra*
- compound; e.g., *del, dello, dell', della, dei, degli, delle*

(continued)

2. Structured Situations: This term is used to describe learning situations where a familiar context for the use of specific linguistic elements is provided and students are guided in the use of these linguistic elements. Students in such situations will have increased awareness and emerging control of the linguistic elements and will be able to apply them in familiar contexts with teacher guidance. Student language is characterized by increasing fluency and confidence.

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(continued)

LC–1 attend to form

LC–1.4 grammatical elements

Students will be able to:

c. use, independently and consistently,[3] the following grammatical elements: .....

Italian Language and Culture 10-3Y

Nouns:
- gender and number; e.g., *bambino/bambini, bambina/bambine, classe/classi*

Pronouns:
- personal: *io, tu, lui, lei, noi, voi, loro*
- reflexive: *mi, ti, si, ci, vi, si*
- disjunctive: *a me, a te, a lui, a lei, a noi, a voi, a loro*
- demonstrative: *questo, questi, questa, queste; quel, quello, quell', quella, quei, quelli, quegli, quelle*

Interrogatives:
- *che, chi, cosa, dove, quando, come, perché, quanto/quanti, quanta/quante*

Articles:
- definite: *il, lo, l', la, i, gli, le*
- indefinite: *un, uno, una, un'*

Verbs:
- imperative of verbs in *-are, -ere, -ire*
- present of verbs in *-are, -ere, -ire; avere* and *essere; fare* and *dare*
- impersonal verb *piacere*; e.g., *mi piace la mela, mi piacciono le mele*
- present progressive of verbs in *-are, -ere, -ire*; e.g., *sto studiando, sto leggendo, sto dormendo*

Italian Language and Culture 20-3Y

Nouns:
- derivatives
- diminutives

Pronouns:
- direct object: *lo, li, la, le*
- relative: *che, cui*

Articles:
- partitive: *del, dello, dell', della, dei, degli, delle*

Verbs:
- reflexive; e.g., *mi lavo, mi siedo, mi vesto*
- future of verbs in *-are, -ere, -ire*
- present tense of *sapere, conoscere*

Italian Language and Culture 30-3Y

Nouns:
- collective; e.g., *gregge*
- abstract; e.g., *virtù, amore*
- compound; e.g., *capolavoro*

Pronouns:
- indirect object: *le, gli, loro*
- double object: *me lo, te lo, glielo, ce lo, ve lo, lo* (verb) *loro*
- possessive; e.g., *il mio, il tuo, il suo*

Verbs:
- present perfect of verbs in *-are, -ere, -ire*
- imperfect of verbs in *-are, -ere, -ire*
- present tense of modal verbs: *volere, potere, dovere*
- present conditional of verbs in *-are, -ere, -ire*

(continued)

3. Independently and Consistently: This term is used to describe learning situations where students use specific linguistic elements in a variety of contexts with limited teacher guidance. Students in such situations will have consistent control of the linguistic elements and will be able to apply them in a variety of contexts with limited teacher guidance. Fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

(continued)

LC–1 attend to form

LC–1.4
grammatical elements

Italian Language and Culture 10-3Y

Adjectives:
- gender and number; e.g., *piccolo/piccoli, piccola/piccole; grande/grandi*
- cardinal numbers; e.g., *uno, due, tre*
- ordinal numbers; e.g., *primo, secondo, terzo*
- possessive; e.g., *il mio, il tuo, il suo*
- demonstrative: *questo, questi, questa, queste; quel, quello, quell', quella, quei, quelli, quegli, quelle*

Adverbs:
- *bene, male, molto, poco*

Conjunctions:
- *e, o, ma, poi*

Negative Form:
- e.g., *non studio, non leggo, non dormo*

Italian Language and Culture 20-3Y

Adjectives:
- comparative: *così* (adjective) *come, tanto* (adjective) *quanto, più* (adjective) *di, più* (adjective) *che, meno* (adjective) *di, meno* (adjective) *che*

Adverbs:
- comparative: *meno, più, meglio, peggio*

Conjunctions:
- *dopo, allora, prima*

Italian Language and Culture 30-3Y

Adjectives:
- absolute superlative; e.g., *molto alto, altissimo*
- irregular superlative; e.g., *ottimo, pessimo, maggiore, minore*
- relative superlative: *il più* (adjective) *di, la più* (adjective) *di*

Adverbs:
- of time: *durante, mentre, ora*
- absolute superlative: *benissimo, malissimo, moltissimo, pochissimo*
- adjective with *-mente*; e.g., *lentamente, facilmente, caramente*

Prepositions:
- simple: *di, a, da, in, con, su, per, tra, fra*
- compound; e.g., *del, dello, dell', della, dei, degli, delle*

Conjunctions:
- *però*

Negative Expressions:
- e.g., *non* (verb) *più*
  non (verb) *ancora*
  non (verb) *mai*
  non (verb) *niente*

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

LC–2 interpret and produce oral and written texts

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
LC–2.1 aural interpretation	a. understand a series of simple spoken sentences from a variety of media in guided situations	a. understand short, simple oral texts from a variety of media in guided and unguided situations	a. understand short oral texts on unfamiliar topics from a variety of media in guided situations
LC–2.2 written interpretation	a. understand a series of simple written sentences from a variety of media in guided situations	a. understand short, simple written texts from a variety of media in guided and unguided situations	a. understand short written texts on unfamiliar topics from a variety of media in guided situations
LC–2.3 visual interpretation	a. derive meaning from a variety of visuals and other forms of nonverbal communication in guided situations	a. derive meaning from the visual elements of a variety of media in guided situations	a. derive meaning from the visual elements of a variety of media
LC–2.4 oral production	a. produce simple words and phrases, orally, in guided situations	a. produce short, simple oral texts in guided situations	a. produce short oral texts in guided and unguided situations
LC–2.5 interactive fluency	a. interact, using a sequence of simple sentences, in guided situations	a. engage in simple interactions	a. manage short interactions in familiar situations, with pauses for planning and repair
LC–2.6 written production	a. produce simple words and phrases, in writing, in guided situations	a. produce short, simple written texts in guided situations	a. produce short written texts in guided and unguided situations
LC–2.7 representation	a. express meaning through the use of a variety of visuals and other forms of nonverbal communication in guided situations; e.g., posters, cartoons, illustrations, brochures, Internet, models, graphs, charts, maps, fine arts, videos, television, radio	a. express meaning through the use of visual elements in a variety of media, in guided situations	a. express meaning through the use of multiple visual elements in a variety of media

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

LC–3 apply knowledge of the sociocultural context

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
LC–3.1 register	a. use simple forms of formal and informal language; e.g., *tu, Lei, voi*	a. use formal and informal language appropriately in familiar situations	a. explore formal and informal uses of language in a variety of contexts
LC–3.2 idiomatic expressions	a. understand and use some simple idiomatic expressions, with guidance	a. use learned idiomatic expressions, with guidance, to enhance communication	a. use learned idiomatic expressions appropriately in a variety of situations
LC–3.3 variations in language	a. identify variations in language; e.g., regional, age-related, gender, social class, accent	a. acknowledge variations in language; e.g., regional, age-related, gender, social class, accent	a. adopt some variations in language; e.g., regional, age-related, gender, social class, accent
LC–3.4 social conventions	a. use basic social expressions and conventions appropriate to familiar situations; e.g., handshake, kiss on both cheeks	a. identify and use learned expressions and conventions in various social interactions and formal and informal situations	a. explore and use a variety of social conventions
LC–3.5 nonverbal communication	a. understand appropriate nonverbal behaviours; e.g., body language	a. recognize and use appropriate nonverbal behaviours in a variety of familiar contexts; e.g., eye contact	a. use a variety of forms of nonverbal communication appropriately

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

LC–4 apply knowledge of how the Italian language is organized, structured and sequenced

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
LC–4.1 cohesion/coherence	a. sequence elements of a simple story, process or series of events	a. organize texts using common patterns; e.g., cause and effect, straightforward time sequencing	a. link simple texts coherently
	b. link words or groups of words in simple ways; e.g., *e, poi*	b. link several sentences coherently	b. organize texts to indicate steps in a procedure or directions to follow
	c. interpret basic references within simple texts; e.g., pronouns, demonstratives	c. use common conventions to structure texts; e.g., titles, paragraphs	
LC–4.2 text forms	a. recognize a variety of simple oral and print text forms; e.g., lists, letters, stories, songs	a. recognize a variety of oral and print text forms; e.g., recipes, invitations, messages	a. recognize different text forms delivered through a variety of media; e.g., videotaped instructions, reports with visuals
		b. use some simple text forms in their own productions; e.g., maps, questionnaires	b. analyze and identify the organizational structure of a variety of text forms; e.g., folk tales, newspaper articles, instructions for a game
LC–4.3 patterns of social interaction	a. initiate and respond to basic social interaction patterns; e.g., question–answer	a. use simple conventions to open and close conversations and to manage turn taking	a. use complex social interaction patterns; e.g., *Mi scusi, potrebbe dirmi …*
		b. initiate and respond to a variety of social interaction patterns; e.g., statement–agreement/disagreement–reaction	

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Global Citizenship

historical and contemporary elements of Italian-speaking cultures

affirming and valuing diversity

Students will acquire the knowledge, skills and attitudes to be effective global citizens, through the exploration of the cultures of the Italian-speaking world.

personal and career opportunities

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GLOBAL CITIZENSHIP

The learning outcomes for Global Citizenship deal with the development of intercultural competence, encompassing some of the knowledge, skills and attitudes that students need in order to be effective global citizens. The concept of global citizenship encompasses citizenship at all levels, from the local school and community to Canada and the world.

The various components of global citizenship are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of intercultural competence. For example, under the cluster heading "historical and contemporary elements of Italian-speaking cultures," there are strands for the processes and methods of acquiring knowledge about Italian-speaking cultures, applications of that knowledge to aid comprehension and to communicate in appropriate ways, positive attitudes toward Italian-speaking cultures as well as knowledge of the diversity within those cultures.

Developing cultural knowledge and skills is a lifelong process. Knowledge of one's own culture is acquired over a lifetime. Cultures change over time. Within any national group, there may be a dominant culture or cultures and a number of minority cultures. Rather than developing a bank of knowledge about the Italian-speaking cultures, it is more important for students to develop skills in accessing and understanding information about culture and in applying that knowledge for the purposes of interaction and communication. Students will gain cultural knowledge in the process of developing these skills. In this way, if they encounter elements of the cultures they have not learned about in class, they will have the skills and abilities to deal with them effectively and appropriately.

The "affirming and valuing diversity" heading covers knowledge, skills and attitudes that are developed as a result of bringing other languages and cultures into relationship with one's own. There is a natural tendency when learning a new language and culture to compare it with what is familiar. Many students leave a second language learning experience with a heightened awareness and knowledge of their own language and culture. They will also be able to make some generalizations about languages and cultures based on their experiences and those of their classmates, who may have a variety of cultural backgrounds. This will provide students with an understanding of diversity within both a global and a Canadian context.

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

GC–1 historical and contemporary elements of Italian-speaking cultures

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
GC–1.1 accessing/analyzing cultural knowledge of the Italian-speaking world	a. ask questions, using their first language, about elements of Italian cultures experienced in class	a. seek out information about Italian cultures from authentic sources	a. formulate questions in Italian about elements of Italian cultures; e.g., patterns of behaviour or interaction typical of people their own age
	b. make observations of the Italian cultures	b. identify some things they have in common with people their own age who live in an Italian culture	b. use basic research skills to find out about Italian cultures
	c. participate in activities and experiences that reflect elements of Italian cultures	c. compare and make connections between some elements of the Italian culture being studied and their own culture	c. explore and identify some elements of Italian cultures; e.g., key historical events and their influence on contemporary ways of life and cultural values
		d. participate in activities and experiences that reflect elements of Italian cultures	
GC–1.2 applying cultural knowledge	a. identify elements of Italian cultures in the classroom, school and community	a. identify commonalities and differences between Italian cultures and their own	a. apply knowledge of Italian cultures in interactions with people and texts
	b. explore some elements of Italian cultures	b. apply knowledge of Italian cultures to interpret these commonalities and differences	b. interpret cultural behaviour that is different from their own
GC–1.3 diversity within Italian-speaking cultures	a. recognize diverse elements of Italian cultures	a. identify commonalities and differences among diverse groups within the cultures	a. apply knowledge of diverse elements of Italian cultures
	b. identify some elements that reflect diversity within Italian cultures	b. apply knowledge of the Italian cultures to interpret these commonalities and differences	
GC–1.4 valuing Italian-speaking cultures	a. participate in Italian cultural activities	a. participate in Italian cultural activities and experiences	a. express empathy for those whose cultural behaviour is different from their own
		b. identify similarities between themselves and people of the culture being studied	b. participate in and contribute to activities and experiences that reflect Italian cultures

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

GC–2 affirming and valuing diversity

	Italian Language and Culture 10-3Y *Students will be able to:*	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
GC–2.1 awareness of first language	a. recognize similarities and differences between their first language and Italian; e.g., cognates	a. compare written and oral aspects of their first language and Italian	a. identify ways in which their first language and Italian are similar and different
GC–2.2 general language knowledge	a. explore the variety of languages spoken by those around them b. identify differences and similarities between words and writing systems from different languages within their personal experience c. recognize that languages can be grouped into families based on common origins	a. describe ways that languages can be taught and learned b. recognize that within any linguistic group individuals use language in personal ways c. recognize that in any language there are different words for the same thing	a. identify how and why languages borrow from one another b. recognize that languages evolve and adapt over time
GC–2.3 awareness of own culture	a. explore and recognize similarities and differences between their own culture and other cultures	a. recognize and identify similarities and differences between their own culture and other cultures b. make connections between individuals or situations in texts and their own personal experiences	a. identify some influences on the development of their personal identity
GC–2.4 general cultural knowledge	a. recognize that culture is expressed through a variety of forms b. recognize that a variety of cultural practices are followed by their classmates and different groups in their community c. participate in activities and experiences that reflect elements of different cultures	a. recognize that speakers of the same language may come from different cultural backgrounds	a. identify that within any culture there are important differences in the way people speak and behave b. identify some of the factors that affect the culture of a particular region c. explore various ways in which individuals acquire a cultural identity

(continued)

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

(continued)

GC–2 affirming and valuing diversity

	Italian Language and Culture 10-3Y *Students will be able to:*	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
GC–2.5 valuing diversity	a. work and interact with others	a. engage in activities that reflect other ways of doing things or other perspectives b. identify the limitations of adopting a single perspective	a. recognize and acknowledge different perspectives
GC–2.6 intercultural skills	a. adapt to new situations b. listen with attention to the opinions of others c. initiate and maintain new relationships	a. reflect on their actions and the consequences of their actions for others b. explore how their perspective is shaped by a variety of factors	a. explore representations of their own culture as seen from the outside b. identify and make use of institutions that facilitate contact with other countries and cultures

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

GC–3 personal and career opportunities

	Italian Language and Culture 10-3Y *Students will be able to:*	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
GC–3.1 Italian and Italian-speaking cultures	a. identify reasons for learning Italian, and identify some places they could visit where Italian is spoken	a. identify some careers for which knowledge of Italian is useful, and recognize that knowledge of an additional language is an asset to any career	a. explore opportunities for further studies or careers related to Italian, and explore applications of Italian language and culture in the global workplace and marketplace and in their personal and social lives
GC–3.2 cultural and linguistic diversity	a. identify some reasons for participating in activities and experiences that reflect elements of different cultures b. identify reasons for learning an additional language and learning about global cultures	a. explore careers in which knowledge of additional languages and intercultural skills can be applied	a. explore applications of language and cultural learning in their personal and social lives and in the global workplace and marketplace

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Strategies

language learning

language use

Students will know and use various strategies to maximize the effectiveness of learning and communication.

general learning

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STRATEGIES

Under the Strategies heading are specific outcomes that will help students learn and communicate more **effectively**. Strategic competence has long been recognized as an important component of communicative competence. The learning outcomes that follow deal not only with compensation and repair strategies, important in the early stages of language learning when proficiency is low, but with strategies for language learning, language use in a broader sense, as well as general learning strategies that help students acquire content. Although people may use strategies unconsciously, the learning outcomes deal only with the **conscious use** of strategies.

The strategies are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands that show the development of awareness and skill in using strategies from course to course. Each strand, identified by a strand heading at the left end of the row, deals with a specific category of strategy. Language learning and general learning strategies are categorized as cognitive, metacognitive and social/affective. The language use strategies are organized by communicative mode: interactive, interpretive, productive.

The strategies that students choose depend on the task they are engaged in as well as on other factors, such as their preferred learning style, personality, age, attitude and cultural background. Strategies that work well for one person may not be effective for another person, or may not be suitable in a different situation. For this reason it is not particularly useful to say that students should be aware of, or able to use, a specific strategy in a particular course. Consequently, the specific outcomes describe the students' knowledge of, and ability to use, general types of strategies. More specific strategies for each general category or type are included in the sample list of strategies below. The specific strategies provided in the sample list **are not prescriptive** but are provided as an illustration of how the general strategies in the specific outcomes might be developed.

Teachers need to know and be able to demonstrate a broad range of strategies from which students are then able to choose in order to communicate effectively. Strategies of all kinds are best taught in the context of learning activities where students can apply them immediately and then reflect on their use.

SAMPLE LIST OF STRATEGIES

Language Learning Strategies

Cognitive

- listen attentively
- perform actions to match words of a song, story or rhyme
- learn short rhymes or songs, incorporating new vocabulary or sentence patterns
- imitate sounds and intonation patterns
- memorize new words by repeating them silently or aloud
- seek the precise term to express meaning
- repeat words or phrases in the course of performing a language task
- make personal dictionaries
- experiment with various elements of the language
- use mental images to remember new information
- group together sets of things—vocabulary, structures—with similar characteristics
- identify similarities and differences between aspects of the Italian language and own language
- look for patterns and relationships
- use previously acquired knowledge to facilitate a learning task
- associate new words or expressions with familiar ones, either in Italian or in own language
- find information, using reference materials like dictionaries, textbooks and grammars
- use available technological aids to support language learning; e.g., cassette recorders, computers
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember

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- place new words or expressions in a context to make them easier to remember
- use induction to generate rules governing language use
- seek opportunities outside of class to practise and observe
- perceive and note down unknown words and expressions, noting also their context and function
- be aware of cognates whose meanings vary in different languages

Metacognitive
- check copied writing for accuracy
- make choices about how you learn
- rehearse or role-play language
- decide in advance to attend to the learning task
- reflect on learning tasks with the guidance of the teacher
- make a plan in advance about how to approach a language learning task
- reflect on the listening, reading and writing process
- decide in advance to attend to specific aspects of input
- listen or read for key words
- evaluate own performance or comprehension at the end of a task
- keep a learning log
- experience various methods of language acquisition, and identify one or more considered to be particularly useful personally
- be aware of the potential of learning through direct exposure to the language
- know how strategies may enable coping with texts containing unknown elements
- identify problems that might hinder successful completion of a task, and seek solutions
- monitor own speech and writing to check for persistent errors
- be aware of own strengths and weaknesses, identify own needs and goals, and organize strategies and procedures accordingly

Social/Affective
- initiate or maintain interaction with others
- participate in shared reading experiences
- seek the assistance of a friend to interpret a text
- reread familiar self-chosen texts to enhance understanding and enjoyment
- work cooperatively with peers in small groups
- understand that making mistakes is a natural part of language learning
- experiment with various forms of expression, and note their acceptance or nonacceptance by more experienced speakers
- participate actively in brainstorming and conferencing as prewriting and postwriting exercises
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- repeat new words and expressions occurring in own conversations, and make use of these new words and expressions as soon as appropriate
- reduce anxiety by using mental techniques, such as positive self-talk or humour
- work with others to solve problems, and get feedback on tasks
- provide personal motivation by arranging own rewards when successful

Language Use Strategies

Interactive
- use words from own first language to get meaning across; e.g., use a literal translation of a phrase in the first language, use a first language word but pronounce it as in the second language
- acknowledge being spoken to
- interpret and use a variety of nonverbal cues to communicate; e.g., mime, pointing, gestures, drawing pictures
- indicate lack of understanding verbally or nonverbally; e.g., *scusi, mi dispiace, non ho capito*, raised eyebrows, blank look
- ask for clarification or repetition when something is not understood; e.g., *Che cosa vuoi dire*?, *Può ripetere, per favore*?
- use other speakers' words in subsequent conversations
- assess feedback from a conversation partner to recognize when a message has not been understood; e.g., raised eyebrows, blank look

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- start again, using a different tactic, when communication breaks down; e.g., *Quello che cerco di dire è ...*
- use a simple word similar to the concept to convey, and invite correction; e.g., *pesce* for *trota*
- invite others into the discussion
- ask for confirmation that a form used is correct; e.g., *Si può dire così*?
- use a range of fillers, hesitation devices and gambits to sustain conversations; e.g., *ma, veramente, dov'ero*
- use circumlocution to compensate for lack of vocabulary; e.g., *quello per appendere i panni* for *attaccapanni*
- repeat part of what someone has said to confirm mutual understanding; e.g., *Allora, quello che tu vuoi dire è ...*
- summarize the point reached in a discussion to help focus the talk
- ask follow-up questions to check for understanding; e.g., *Mi spiego*?
- use suitable phrases to intervene in a discussion; e.g., *parlando di ...*
- self-correct if errors lead to misunderstandings; e.g., *Quello che voglio dire è ...*

Interpretive

- use gestures, intonation and visual supports to aid comprehension
- make connections between texts on the one hand and prior knowledge and personal experience on the other
- use illustrations to aid reading comprehension
- determine the purpose of listening
- listen or look for key words
- listen selectively based on purpose
- make predictions about what is expected to be heard or read, based on prior knowledge and personal experience
- use knowledge of the sound–symbol system to aid reading comprehension
- infer probable meanings of unknown words or expressions from contextual clues
- prepare questions or a guide to note down information found in a text
- use key content words or discourse markers to follow an extended text
- reread several times to understand complex ideas
- summarize information gathered
- assess own information needs before listening, viewing or reading
- use skimming and scanning to locate key information in texts

Productive

- mimic what the teacher says
- use nonverbal means to communicate
- copy what others say or write
- use words visible in the immediate environment
- use resources to increase vocabulary
- use familiar repetitive patterns from stories, songs, rhymes or media
- use illustrations to provide detail when producing own texts
- use various techniques to explore ideas at the planning stage, such as brainstorming or keeping a notebook or log of ideas
- use knowledge of sentence patterns to form new sentences
- be aware of and use the steps of the writing process: prewriting (gathering ideas, planning the text, researching, organizing the text), writing, revision (rereading, moving pieces of text, rewriting pieces of text), correction (grammar, spelling, punctuation), publication (reprinting, adding illustrations, binding)
- use a variety of resources to correct texts; e.g., personal and commercial dictionaries, checklists, grammars
- take notes when reading or listening to assist in producing own text
- revise and correct final version of text
- use circumlocution and definition to compensate for gaps in vocabulary
- apply grammar rules to improve accuracy at the correction stage
- compensate for avoiding difficult structures by rephrasing

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General Learning Strategies

Cognitive

- classify objects and ideas according to their attributes; e.g., red objects and blue objects, or animals that eat meat and animals that eat plants
- use models
- connect what is already known with what is being learned
- experiment with and concentrate on one thing at a time
- focus on and complete learning tasks
- record key words and concepts in abbreviated form—verbal, graphic or numerical—to assist with performance of a learning task
- use mental images to remember new information
- distinguish between fact and opinion when using a variety of sources of information
- formulate key questions to guide research
- make inferences, and identify and justify the evidence on which these inferences are based
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember
- seek information through a network of sources, including libraries, the Internet, individuals and agencies
- use previously acquired knowledge or skills to assist with a new learning task

Metacognitive

- reflect on learning tasks with the guidance of the teacher
- reflect upon own thinking processes and how you learn
- choose from among learning options
- discover how own efforts can affect learning
- decide in advance to attend to the learning task
- divide an overall learning task into a number of subtasks
- make a plan in advance about how to approach a task
- identify own needs and interests
- manage own physical working environment
- keep a learning journal, such as a diary or a log
- develop criteria for evaluating own work
- work with others to monitor own learning
- take responsibility for planning, monitoring and evaluating learning experiences

Social/Affective

- watch others' actions and copy them
- seek help from others
- follow own natural curiosity and intrinsic motivation to learn
- participate in cooperative group learning tasks
- choose learning activities that enhance understanding and enjoyment
- be encouraged to try, even though mistakes might be made
- take part in group decision-making processes
- use support strategies to help peers persevere at learning tasks; e.g., offer encouragement, praise, ideas
- take part in group problem-solving processes
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- monitor own level of anxiety about learning tasks, and take measures to lower it if necessary; e.g., deep breathing, laughter
- use social interaction skills to enhance group learning activities

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
S–1.1 cognitive	a. use simple cognitive strategies, with guidance, to enhance language learning; e.g., memorize new words by repeating them silently or aloud	a. identify and use a variety of cognitive strategies to enhance language learning; e.g., group together sets of things (vocabulary, structures) with similar characteristics, identify and use similarities and differences between aspects of Italian and their own language	a. select and use a variety of cognitive strategies to enhance language learning; e.g., use technology and other reference materials
S–1.2 metacognitive	a. use simple metacognitive strategies, with guidance, to enhance language learning; e.g., rehearse or role-play language, discover how own efforts can affect learning	a. identify and use a variety of metacognitive strategies to enhance language learning; e.g., reflect on learning tasks with guidance	a. select and use a variety of metacognitive strategies to enhance language learning; e.g., reflect upon own performance and that of others
S–1.3 social/affective	a. use simple social and affective strategies, with guidance, to enhance language learning; e.g., work cooperatively with peers in small groups, seek assistance from others	a. identify and use a variety of social and affective strategies to enhance language learning; e.g., engage in unfamiliar tasks and approaches with guidance	a. select and use a variety of social and affective strategies to enhance language learning; e.g., participate actively in brainstorming for a newly given task

Further examples of language learning strategies are available on pages 30 and 31.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–2 language use

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
S–2.1 interactive	a. use simple interactive strategies with guidance; e.g., indicate lack of understanding verbally or nonverbally	a. identify and use a variety of interactive strategies; e.g., use different techniques to maintain communication	a. select and use a variety of interactive strategies; e.g., use a range of communicative devices to sustain conversations
S–2.2 interpretive	a. use simple interpretive strategies with guidance; e.g., use illustrations, gestures and intonation to aid comprehension	a. identify and use a variety of interpretive strategies; e.g., seek key words and expressions, make inferences based on prior knowledge	a. select and use a variety of interpretive strategies; e.g., prepare questions or a guide to facilitate comprehension
S–2.3 productive	a. use simple productive strategies with guidance; e.g., use words in the immediate environment	a. identify and use a variety of productive strategies; e.g., use knowledge of sentence patterns to form new sentences	a. select and use a variety of productive strategies; e.g., use a variety of resources to sustain and enrich communication

Further examples of language use strategies are available on pages 31 and 32.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–3 general learning

	Italian Language and Culture 10-3Y	Italian Language and Culture 20-3Y	Italian Language and Culture 30-3Y
	Students will be able to:		
S–3.1 cognitive	a. use simple cognitive strategies to enhance general learning; e.g., connect what they already know with what they are learning	a. identify and use a variety of cognitive strategies to enhance general learning; e.g., write down key words and concepts	a. select and use a variety of cognitive strategies to enhance general learning; e.g., distinguish between fact and opinion when using a variety of sources of information
S–3.2 metacognitive	a. use simple metacognitive strategies to enhance general learning; e.g., discover how own efforts can affect learning	a. identify and use a variety of metacognitive strategies to enhance general learning; e.g., make a plan in advance about how to approach a task	a. select and use a variety of metacognitive strategies to enhance general learning; e.g., take responsibility for planning, monitoring and reflecting on learning experiences
S–3.3 social/affective	a. use simple social and affective strategies to enhance general learning; e.g., seek assistance from others	a. identify and use a variety of social and affective strategies to enhance general learning; e.g., take risks	a. select and use a variety of social and affective strategies to enhance general learning; e.g., use support strategies to help and encourage one another

Further examples of general learning strategies are available on page 33.

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ITALIAN LANGUAGE AND CULTURE 10-6Y, 20-6Y, 30-6Y

This program of studies is intended for students who began their study of Italian language and culture in Grade 7. It constitutes the last three years of the Italian Language and Culture Six-year (6Y) Program. The Italian Language and Culture Six-year Program, Grades 7–8–9, constitutes the first three years of the six-year program.

INTRODUCTION

Global Citizenship

Preparing youth to meet the challenges of the new millennium, in a world that is increasingly interdependent, is one of the more important objectives of language education.

Globalization and our multicultural society have increased the need for knowledge of other languages and cultures for effective communication, for better human relations within our own diverse Canadian society, and for a competitive edge in the shrinking world of economics.

Through the study of languages, students learn to recognize, respect and appreciate the cultural diversity of Canadian society and the countries of the world.

Learning Italian, just as learning any other language, develops thinking skills and learning strategies that are transferable to other learning situations.

Knowledge of Italian is helpful for understanding the development of European culture. The study of Italian also develops awareness of, and sensitivity to, the cultural and linguistic diversity of Canadian society.

A Means of Communication

Communication is the fundamental basis for human relationships. Italian is learned to enable communication with Italian speakers, but it is also useful in many fields of endeavour, including the study of bel canto; classical music; cultural, historical and scientific research; and travelling. Italy, as a modern industrialized country, attracts millions of people from every corner of the globe to its shores for many reasons.

Millions of Italians have migrated to many countries, including Canada, in the last two centuries. Language and culture have been retained wherever Italians have settled. Toronto, Montreal, New York and Melbourne are a few examples of cities where Italian culture has flourished and where language has been retained.

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Personal and Cognitive Benefits

There is plenty of evidence to suggest that learning another language contributes to the development of first language skills and enhances not only vocabulary but improves cognitive functioning. Learning a second language increases the ability to conceptualize and to think abstractly; and it fosters more cognitive flexibility, greater divergent thinking, creativity and metalinguistic competence.

Maintaining Language Skills and Cultural Connections

For those students who already have some knowledge of Italian or a family connection to the culture, there is the opportunity to renew contact with the language, culture and heritage.

Economic Benefits

In today's world, knowledge of another language and culture in general, and Italian language and culture in particular, is very valuable. It can open the door to exciting career opportunities in almost every kind of business, industry and profession. Indeed, the knowledge of another language and culture enables people to communicate and interact effectively in the global marketplace and workplace.

ASSUMPTIONS

The following statements are assumptions that have guided the development process of this program of studies.

- Language is communication.
- All students can be successful learners of language and culture, although they will learn in a variety of ways and acquire proficiency at varied rates.
- All languages can be taught and learned.
- Learning Italian as a second language leads to enhanced learning in both the student's primary language and in related areas of cognitive development and knowledge acquisition. This is true of students who come to the class with some background knowledge of Italian and develop literacy skills in the language. It is also true for students who have no cultural or linguistic background in Italian and are studying Italian as a second language.

THE CONCEPTUAL MODEL

The aim of this program of studies is the development of communicative competence in Italian.

Four Components

For the purposes of this program of studies, communicative competence is represented by four interrelated and interdependent components.

Applications deal with what the students will be able to do with the language, the functions they will be able to perform and the contexts in which they will be able to operate.

Language Competence addresses the students' knowledge of the language and their ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used.

Global Citizenship aims to develop intercultural competence, with a particular focus on cultures of the Italian-speaking world.

Strategies help students learn and communicate more effectively and more efficiently.

Each of these components is described more fully at the beginning of the corresponding section of this program of studies.

Modes of Communication

Because of the focus on using language to communicate in specific contexts, with a particular purpose or task in mind, three modes of communication are used to organize some of the specific outcomes.

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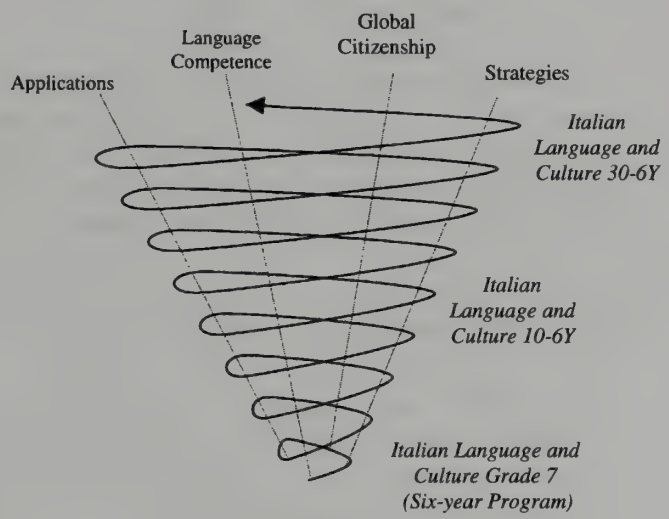
Interaction is most often direct, face-to-face oral communication, but it can take the form of written communication between individuals, using a medium such as e-mail where the exchange of information is fairly immediate. It is characterized principally by the opportunity to actively negotiate meaning; that is, helping others understand and working to understand others. Interactive communication generally requires more speed but less accuracy than the other two modes.

Interpretation is receptive communication of oral and written messages in contexts where the listener or reader is not in direct contact with the creator of the message. While there is no opportunity to ask for clarification, there is sometimes the possibility of rereading or listening again, consulting references, or making the meaning clearer in other ways. Reading and listening will sometimes involve **viewing** and interpreting visual elements, such as illustrations in books or moving images in television and film. Interpretation goes beyond a literal comprehension to include an understanding of some of the unspoken or unwritten meaning intended by the speaker or author.

Production is communication of oral and written messages in contexts where the audience is not in personal contact with the speaker or writer, or in situations of one-to-many communication; e.g., a lecture or a performance where there is no opportunity for the listener to interact with the speaker. Oral and written presentations will sometimes be enhanced by **representing** the meaning visually, using pictures, diagrams, models, drama techniques or other nonverbal forms of communication. Greater knowledge of the language and culture is required to ensure that communication is successful, since the participants cannot directly negotiate meaning.

A Spiral Progression

Language learning is integrative, not merely cumulative. Each new element that is added must be integrated into the whole of what has gone before. The model that best represents the students' language learning progress is an expanding spiral. Their progression is not only vertical (e.g., increased proficiency) but also horizontal (e.g., broader range of applications and experience with more text forms, contexts and so on). The spiral also represents how language learning activities are best structured. Particular lexical fields, learning strategies or language functions, for example, are revisited at different points in the program, but from a different perspective, in broader contexts or at a slightly higher level of proficiency each time. Learning is reinforced, extended and broadened with each successive pass.



ORGANIZATION OF THE PROGRAM OF STUDIES

General Outcomes

General outcomes are broad statements identifying the knowledge, skills and attitudes that students are expected to achieve in the course of their language learning experience. The four general outcomes serve as the foundation for this program of studies and are based on the conceptual model outlined above.

Applications [A]

- Students will use Italian in a variety of **situations** and for a variety of **purposes**.

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Language Competence [LC]

- Students will use Italian **effectively** and **competently**.

Global Citizenship [GC]

- Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

Strategies [S]

- Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

The order in which the general outcomes are presented in the program of studies does not represent a sequential order, nor does it indicate the relative importance of each component. The general outcomes are to be implemented in an integrated manner.

Specific Outcomes

Each general outcome is further broken down into specific outcomes that students are to achieve by the end of each course. The specific outcomes are interrelated and interdependent. In most classroom activities, a number of learning outcomes will be dealt with in an integrated manner.

The specific outcomes are categorized under cluster headings, which show the scope of each of the four general outcomes. These headings are shown in the table on the following page.

The specific outcomes are further categorized by strands, which show the developmental flow of learning from the beginning to the end of the program. However, an outcome for a particular course will not be dealt with only in that particular year of the program. The spiral progression that is part of the conceptual model means that activities in the years preceding will prepare the ground for acquisition and in the years following will broaden applications.

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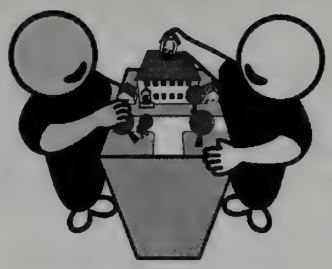
General Outcomes

Applications



Students will use Italian in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information
A–2 to express emotions and personal perspectives
A–3 to get things done
A–4 to form, maintain and change interpersonal relationships
A–5 to extend their knowledge of the world
A–6 for imaginative purposes and personal enjoyment

Language Competence

Students will use Italian **effectively** and **competently**.

LC–1 attend to form
LC–2 interpret and produce oral and written texts
LC–3 apply knowledge of the sociocultural context
LC–4 apply knowledge of how the Italian language is organized, structured and sequenced

Global Citizenship

Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

GC–1 historical and contemporary elements of Italian-speaking cultures
GC–2 affirming and valuing diversity
GC–3 personal and career opportunities

Strategies

Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning
S–2 language use
S–3 general learning

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Guide to Reading the Program of Studies

General Outcome for Applications
Students will use Italian in a variety of **situations** and for a variety of **purposes**.

cluster heading for specific outcomes

A–6 for imaginative purposes and personal enjoyment

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
A–6.1 humour/fun	a. use Italian for fun and to interpret humour; e.g., interpret humorous cartoons, songs and poems	a. use Italian for fun and to interpret and express humour; e.g., learn and perform songs, dances and short plays	a. use Italian for fun and to interpret and express humour in a variety of situations
A–6.2 creative/aesthetic purposes	a. engage in creative, aesthetic language activities; e.g., create a picture story with captions, or create and perform a skit	a. use Italian creatively and for aesthetic purposes; e.g., write new words to a known melody, or create a rap	a. use Italian creatively and for aesthetic purposes
A–6.3 personal enjoyment	a. use Italian for personal enjoyment; e.g., find a personal pen pal and exchange letters	a. use Italian for personal enjoyment; e.g., use the Internet, watch television or films	a. use Italian for personal enjoyment in a variety of situations

read each page vertically for outcomes expected at the end of each course

strand headings for specific outcomes

specific outcome statements for each course

read each page horizontally for developmental flow of outcomes from course to course

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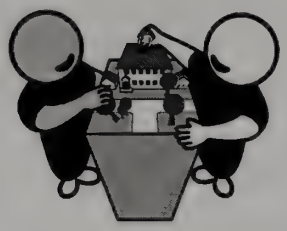

Applications

to express emotions and personal perspectives

to receive and impart information

to get things done

Students will use Italian in a variety of situations and for a variety of purposes.

to form, maintain and change interpersonal relationships

for imaginative purposes and personal enjoyment

to extend their knowledge of the world

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APPLICATIONS

The specific outcomes under the heading Applications deal with **what** the students will be able to do with the Italian language; that is, the **functions** they will be able to perform and the **contexts** in which they will be able to operate.

The functions are grouped under six cluster headings—see the illustration on the preceding page. Under each of these headings there are one or more strands, which show the developmental flow of learning from course to course. Each strand, identified by a strand heading at the left end of a row, deals with a specific language function; e.g., share factual information. Students at any grade level will be able to share factual information. Beginning learners will do this in very simple ways. As students gain more knowledge and experience, they will broaden the range of subjects they can deal with, they will learn to share information in writing as well as orally, and they will be able to handle formal and informal situations.

Different models of communicative competence have organized language functions in a variety of ways. The organizational structure chosen here reflects the needs and interests of students in a classroom where activities are focused on meaning and are interactive. For example, the strand entitled "manage group actions" has been included to ensure that students acquire the language necessary to function independently in small groups, since this is an effective way of organizing second language classrooms. The strands under the cluster heading "to extend their knowledge of the world" will accommodate a content-based approach to language learning where students learn content from another subject area as they learn the Italian language.

The level of linguistic, sociolinguistic and discourse competence that students will exhibit when carrying out the functions is defined in the specific outcomes for Language Competence for each course. To know how well students will be able to perform the specific function, the Applications outcomes must be read in conjunction with the Language Competence outcomes.

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General Outcome for Applications
Students will use Italian in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
A–1.1 share factual information	a. provide information on several aspects of a topic; e.g., give a simple report b. understand and use definitions, comparisons and examples	a. share facts about events that took place in the past or that may take place in the future	a. share detailed information on a specific topic; e.g., a report or biography

A–2 to express emotions and personal perspectives

	Students will be able to:		
A–2.1 share ideas, thoughts, opinions, preferences	a. inquire about and express agreement and disagreement, approval and disapproval, satisfaction and dissatisfaction, and interest and lack of interest	a. inquire about and express probability and certainty	a. express opinions b. support their own opinions
A–2.2 share emotions, feelings	a. inquire about and express emotions and feelings in a variety of familiar contexts b. compare the expression of emotions and feelings in a variety of informal situations	a. express emotions and feelings in formal situations; e.g., communicate a complaint in a store or restaurant	a. compare the expression of emotions and feelings in formal and informal situations

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General Outcome for Applications
Students will use Italian in a variety of **situations** and for a variety of **purposes**.

A–3 to get things done

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
A–3.1 guide actions of others	a. make and respond to suggestions in a variety of situations b. give and respond to advice and warnings	a. make and respond to suggestions or requests in formal situations; e.g., in a bank, department store, restaurant	a. express a complaint
A–3.2 state personal actions	a. state personal actions in the past, present or future b. make a promise, and express intention in a variety of situations	a. accept or decline an offer or invitation, giving an explanation	a. express possibility in relation to their own actions
A–3.3 manage group actions	a. check for agreement and understanding b. express disagreement in an appropriate way c. express appreciation, enthusiasm, support and respect for contributions of others	a. clarify another member's contribution	a. take on a leadership role in small-group projects b. paraphrase and elaborate on another member's contribution

A–4 to form, maintain and change interpersonal relationships

	Students will be able to:		
A–4.1 manage personal relationships	a. initiate and participate in casual exchanges with classmates b. use routine means of interpersonal communications; e.g., telephone calls, personal notes, e-mail messages	a. give and respond to compliments	a. offer and respond to congratulations, and express sympathy or regret

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General Outcome for Applications
Students will use Italian in a variety of **situations** and for a variety of **purposes**.

A–5 to extend their knowledge of the world

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
A–5.1 discover and explore	a. ask questions to gain knowledge and clarify understanding b. explore meaning in a variety of ways; e.g., drawing a diagram, making a model, rephrasing	a. explore and express the meaning of what they are doing; e.g., what they will learn from a particular activity	a. explore connections among and gain new insights into familiar topics; e.g., using analogy, brainstorming
A–5.2 gather and organize information	a. gather information from a variety of resources; e.g., print, human, multimedia b. organize and manipulate information; e.g., transform information from texts into other forms, such as tables, diagrams and story maps	a. gather information, using a prepared format; e.g., interview people using prepared questions	a. identify key ideas, summarize, and paraphrase
A–5.3 solve problems	a. describe a problem, and propose solutions	a. generate and evaluate alternative solutions to problems	a. use information collected from various sources to solve problems
A–5.4 explore opinions and values	a. explore how values influence behaviour; e.g., describe characters and their motivations in a story	a. provide reasons for their position on an issue b. distinguish fact from opinion	a. understand the concept of stereotype, and recognize stereotyping in a variety of situations

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General Outcome for Applications
Students will use Italian in a variety of **situations** and for a variety of **purposes**.

A–6 for imaginative purposes and personal enjoyment

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
A–6.1 humour/fun	a. use Italian for fun and to interpret humour; e.g., interpret humorous cartoons, songs and poems	a. use Italian for fun and to interpret and express humour; e.g., learn and perform songs, dances and short plays	a. use Italian for fun and to interpret and express humour in a variety of situations
A–6.2 creative/aesthetic purposes	a. engage in creative, aesthetic language activities; e.g., create a picture story with captions, or create and perform a skit	a. use Italian creatively and for aesthetic purposes; e.g., write new words to a known melody, or create a rap	a. use Italian creatively and for aesthetic purposes
A–6.3 personal enjoyment	a. use Italian for personal enjoyment; e.g., find a personal pen pal and exchange letters	a. use Italian for personal enjoyment; e.g., use the Internet, watch television or films	a. use Italian for personal enjoyment in a variety of situations

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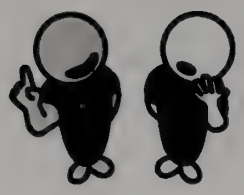
Language Competence



interpret and produce oral and written texts

attend to form

Students will use Italian effectively and competently.

apply knowledge of the sociocultural context

apply knowledge of how the Italian language is organized, structured and sequenced

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LANGUAGE COMPETENCE

Language competence is a broad term that includes linguistic or grammatical competence, discourse competence, sociolinguistic or sociocultural competence, and what might be called textual competence. The specific outcomes under Language Competence deal with knowledge of the Italian language and the ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used. Language competence is best developed in the context of activities or tasks where the language is used for real purposes; in other words, in practical **applications**.

The various components of language competence are grouped under four cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of language competence. For example, under the cluster heading "attend to form," there is a strand for phonology (pronunciation, stress, intonation), orthography (spelling, mechanical features), lexicon (vocabulary words and phrases) and grammatical elements (syntax and morphology).

Although the outcomes isolate these individual aspects, language competence should be developed through learning activities that focus on meaningful uses of the Italian language and on **language in context**. Tasks will be chosen based on the needs, interests and experiences of students. The vocabulary, grammar structures, text forms and social conventions necessary to carry out a task will be taught, practised and assessed as students are involved in various aspects of the task itself, **not in isolation**.

Strategic competence is often closely associated with language competence, since students need to learn ways to compensate for low proficiency in the early stages of learning if they are to engage in authentic language use from the beginning. This component is included in the language use strategies in the Strategies section.

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

LC–1 attend to form

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
LC–1.1 phonology	a. produce essential sounds, stress and intonation patterns of the Italian language	a. use intonation, stress and rhythm appropriately in familiar situations	a. use intonation, stress and rhythm appropriately in a variety of situations
LC–1.2 orthography	a. apply basic spelling rules and use mechanical conventions with reasonable accuracy	a. apply spelling rules and mechanical conventions consistently and accurately	a. apply spelling rules and mechanical conventions consistently and accurately
LC–1.3 lexicon	a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including: • fashion • celebrations • famous people • hobbies • leisure time • the community • any other lexical fields that meet their needs and interests	a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including: • professions and occupations • the environment • health • festivals • media • shopping • any other lexical fields that meet their needs and interests	a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including: • arts and literature • history • personal finances • peace and human rights • fitness for life • nutrition • any other lexical fields that meet their needs and interests b. recognize that one word may have multiple meanings, depending on the context, and that various words and expressions may express the same idea

(continued)

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

(continued)

LC–1 attend to form

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
LC–1.4 grammatical elements	a. use, in modelled situations,[1] the following grammatical elements:		
	Nouns: • masculine ending in *-ema*; e.g., *il problema, i problemi* ***Pronouns:*** • double object; e.g., *me la, te la, gliela, ce la, ve la, la* (verb) *loro* ***Verbs:*** • present conditional of verbs in *-are, -ere, -ire*; e.g., *studierei, leggerei, dormirei* ***Adjectives:*** • irregular superlative; e.g., *ottimo, pessimo, maggiore, minore* ***Adverbs:*** • absolute superlative; e.g., *benissimo, malissimo, moltissimo, pochissimo* ***Prepositions:*** • compound; e.g., *per il, per la, con il, con la*	***Verbs:*** • past absolute of verbs in *-are, -ere, -ire*; e.g., *studiai, credei* or *credetti, dormii* • past conditional of verbs in *-are, -ere, -ire*; e.g., *avrei studiato, avrei letto, avrei dormito, sarei andato/sarei andata* • present subjunctive of verbs in *-are, -ere, -ire*; e.g., *che io studi, che io legga, che io dorma* ***Conjunctions:*** • used with subjunctive; e.g., *benchè, affinchè*	***Verbs:*** • imperfect subjunctive of verbs in *-are, -ere, -ire*; e.g., *che io studiassi, che io leggessi, che io dormissi*

(continued)

1. Modelled Situations: This term is used to describe learning situations where a model of specific linguistic elements is consistently provided and immediately available. Students in such situations will have an emerging awareness of the linguistic elements and will be able to apply them in very limited situations. Limited fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

(continued)

LC–1 attend to form

Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y

Students will be able to:

b. use, in structured situations,[2] the following grammatical elements: .....

LC–1.4 grammatical elements

Pronouns:
- indefinite: *ognuno, ognuna*

Nouns:
- masculine ending in *-ema*; e.g., *il problema, i problemi*
- masculine ending in *-amma*; e.g., *il programma, i programmi*
- *feminine ending in -si*; e.g., *la crisi, le crisi*

Pronouns:
- double object; e.g., *me la, te la, giela, ce la, ve la, la* (verb) *loro*

Verbs:
- present conditional of verbs in *-are, -ere, -ire*; e.g., *studierei, leggerei, dormirei*

Adjectives:
- irregular superlative; e.g., *ottimo, pessimo, maggiore, minore*

Adverbs:
- absolute superlative; e.g., *benissimo, malissimo, moltissimo, pochissimo*

Prepositions:
- compound; e.g., *per il, per la, con il, con la*

Verbs:
- present subjunctive of verbs in *-are, -ere, -ire*
- past absolute of verbs in *-are, -ere, -ire*
- past conditional of verbs in *-are, -ere, -ire*

Conjunctions:
- used with subjunctive; e.g., *benchè, affinchè*

(continued)

2. Structured Situations: This term is used to describe learning situations where a familiar context for the use of specific linguistic elements is provided and students are guided in the use of these linguistic elements. Students in such situations will have increased awareness and emerging control of the linguistic elements and will be able to apply them in familiar contexts with teacher guidance. Student language is characterized by increasing fluency and confidence.

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

(continued)

LC–1 attend to form

Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y

Students will be able to:

c. use, independently and consistently,[3] the following grammatical elements: .....

LC–1.4 grammatical elements

Nouns:
- compound; e.g., *capolavoro*
- collective; e.g., *classe*
- abstract; e.g., *gioia*

Pronouns:
- relative: *a cui*
- indefinite: *ognuno, ognuna*

Articles:
- partitive: *del, dei, dello, degli, della, delle, dell'*

Verbs:
- imperfect of verbs in *-are, -ere, -ire*
- present tense of *sapere* and *conoscere*

Negative Expressions
- *non* (verb) *più*
- *non* (verb) *ancora*
- *non* (verb) *mai*
- *non* (verb) *niente*

Adverbs:
- of time; e.g., *adesso, ora, durante, mentre*

Nouns:
- feminine ending in *-si;* e.g., *la crisi, le crisi*
- masculine ending in *-ema*; e.g., *il problema, i problemi*
- masculine ending in *-amma*; e.g., *il programma, i* programmi

Pronouns:
- indefinite: *qualcuno, qualcuna, ciascuno, ciascuna*
- double object; e.g., *me la, te la, giela, ce la, ve la, la* (verb) *loro*

Verbs:
- present conditional of verbs in *-are, -ere, -ire*

Adjectives:
- irregular superlative; e.g., *ottimo, pessimo, maggiore, minore*

Adverbs:
- absolute superlative; e.g., *benissimo, malissimo, moltissimo, pochissimo*

Prepositions:
- compound; e.g., *per il, per la, con il, con la*

3. Independently and Consistently: This term is used to describe learning situations where students use specific linguistic elements in a variety of contexts with limited teacher guidance. Students in such situations will have consistent control of the linguistic elements and will be able to apply them in a variety of contexts with limited teacher guidance. Fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

LC–2 interpret and produce oral and written texts

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
LC–2.1 aural interpretation	a. understand the meaning of short oral texts in guided and unguided situations	a. understand short oral texts on familiar topics in guided situations	a. understand the main point and some supporting details of oral texts on familiar topics
LC–2.2 written interpretation	a. understand the main point and some supporting details of written texts on familiar topics in guided situations	a. understand the main point and supporting details of written texts on familiar topics in guided situations	a. understand the main point and specific details of written texts on a variety of topics
LC–2.3 visual interpretation	a. derive meaning from a variety of visual elements in a variety of media in guided situations	a. interpret visual elements in a variety of media in guided and unguided situations	a. interpret visual elements in a variety of media, and identify techniques; e.g., the purposes, intended audiences, messages and points of view
LC–2.4 oral production	a. produce oral texts on familiar topics, providing some detail in guided situations	a. produce oral texts on familiar topics, providing a variety of details to support the main point in guided and unguided situations	a. produce oral texts on familiar topics spontaneously and independently, providing a variety of details to support the main point
LC–2.5 interactive fluency	a. engage in short interactions on familiar topics	a. manage simple, spontaneous, routine interactions, asking for repetition or clarification	a. engage in spontaneous exchanges in a variety of situations
LC–2.6 written production	a. produce short, simple written texts in guided and unguided situations	a. produce a variety of short, simple written texts in guided and unguided situations	a. produce written texts on a variety of topics in guided situations
LC–2.7 representation	a. express meaning through the use of a variety of visual elements in guided situations; e.g., advertising, brochures, videos	a. express meaning through the use of visual elements in a variety of media	a. explore a variety of ways that meaning can be expressed through the visual elements in a variety of media

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

LC–3 apply knowledge of the sociocultural context

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
LC–3.1 register	a. explore formal and informal uses of language in a variety of contexts	a. adjust language to social situations and purpose	a. use the appropriate level of formality with a variety of people in a variety of contexts
LC–3.2 idiomatic expressions	a. use learned idiomatic expressions in a variety of contexts, and identify unfamiliar idiomatic expressions in a variety of contexts	a. explore and interpret idiomatic expressions in popular, contemporary culture	a. interpret unfamiliar idiomatic expressions, and use learned idiomatic expressions appropriately in a variety of situations
LC–3.3 variations in language	a. recognize influences resulting in variations in language; e.g., age, social class, geographical region	a. experiment with some variations in language	a. experiment with and adapt to some variations in language
LC–3.4 social conventions	a. explore and use learned social conventions	a. interpret and use a variety of social conventions	a. interpret and use a variety of formal and informal social conventions
LC–3.5 nonverbal communication	a. use appropriate nonverbal behaviours in a variety of familiar contexts	a. interpret and use a variety of forms of nonverbal communication, with guidance	a. interpret and use a variety of forms of nonverbal communication

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General Outcome for Language Competence
Students will use Italian **effectively** and **competently**.

LC–4 apply knowledge of how the Italian language is organized, structured and sequenced

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
LC–4.1 cohesion/coherence	a. use a variety of conventions to structure texts; e.g., pauses, titles, paragraphs and letter forms b. use references within texts; e.g., subject and object pronouns, demonstratives	a. use patterns involving time or chronological sequencing to produce and interpret texts	a. use appropriate words and phrases to show a variety of relationships within texts
LC–4.2 text forms	a. explore, understand and use various text forms, delivered through a variety of media, in guided situations; e.g., videotaped instructions, reports with visuals	a. use a variety of familiar text forms and media in their own productions; e.g., recipes, comic strips, letters, radio or television reports, articles	a. use knowledge of text forms to enhance interpretation and production of texts
LC–4.3 patterns of social interaction	a. initiate and respond to interpersonal communication patterns in guided situations; e.g., social invitations – accept/decline with explanation	a. combine simple social interaction patterns to perform complex transactions and interactions; e.g., suggestion – accept/decline – persuade/negotiate	a. use a wide range of social interaction patterns to deal with routine and some nonroutine transactions and interactions; e.g., request goods/services, express a complaint

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Global Citizenship

historical and contemporary elements of Italian-speaking cultures

affirming and valuing diversity

Students will acquire the knowledge, skills and attitudes to be effective global citizens, through the exploration of the cultures of the Italian-speaking world.

personal and career opportunities

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GLOBAL CITIZENSHIP

The learning outcomes for Global Citizenship deal with the development of intercultural competence, encompassing some of the knowledge, skills and attitudes that students need in order to be effective global citizens. The concept of global citizenship encompasses citizenship at all levels, from the local school and community to Canada and the world.

The various components of global citizenship are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of intercultural competence. For example, under the cluster heading "historical and contemporary elements of Italian-speaking cultures," there are strands for the processes and methods of acquiring knowledge about Italian-speaking cultures, applications of that knowledge to aid comprehension and to communicate in appropriate ways, positive attitudes toward Italian-speaking cultures, as well as knowledge of the diversity within those cultures.

Developing cultural knowledge and skills is a lifelong process. Knowledge of one's own culture is acquired over a lifetime. Cultures change over time. Within any national group, there may be a dominant culture or cultures and a number of minority cultures. Rather than developing a bank of knowledge about the Italian-speaking cultures, it is more important for students to learn the processes and methods of accessing and analyzing cultural practices. Students will gain cultural knowledge in the process of developing these skills. In this way, if they encounter elements of the Italian-speaking cultures they have not learned about in class, they will have the skills and abilities to deal with them effectively and appropriately.

The "affirming and valuing diversity" heading covers knowledge, skills and attitudes that are developed as a result of bringing other languages and cultures into relationship with one's own. There is a natural tendency when learning a new language and culture to compare it with what is familiar. Many students leave a second language learning experience with a heightened awareness and knowledge of their own language and culture. They will also be able to make some generalizations about languages and cultures based on their experiences and those of their classmates, who may have a variety of cultural backgrounds. This will provide students with an understanding of diversity within both a global and a Canadian context.

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

GC–1 historical and contemporary elements of Italian-speaking cultures

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
GC–1.1 accessing/analyzing cultural knowledge	a. formulate questions about elements of the cultures; e.g., patterns of behaviour or interaction typical of people their own age b. explore and identify some elements of the cultures; e.g., key historical events and their influence on contemporary ways of life and cultural values c. use basic research skills to find out about the cultures	a. identify and use a variety of sources of information to find out about Italian cultures b. explore and identify some elements of the cultures; e.g., major current events as a reflection of contemporary ways of life and cultural values	a. organize and represent information about elements of Italian cultures in a variety of ways b. explore and identify some elements of Italian cultures; e.g., cultural values, attitudes and interests of people their own age in an Italian culture
GC–1.2 applying cultural knowledge	a. explore and identify some social aspects of Italian life; e.g., festivals, sports, communities b. understand behaviours that are different from their own; e.g., use of public transportation	a. identify different perspectives on Italian cultures, and speculate on their origins; e.g., stereotypes of the cultures present in their own community	a. apply knowledge of elements of Italian cultures in interactions with people and texts; e.g., interpret historical references
GC–1.3 diversity within Italian-speaking cultures	a. apply knowledge of Italian cultures to interpret similarities and differences among diverse groups within the cultures	a. identify different perspectives on diverse elements of Italian cultures, and speculate on their origins; e.g., stereotypes within Italian cultures	a. apply knowledge of diverse elements of Italian cultures, derived from a variety of sources, to interpret behaviours and texts
GC–1.4 valuing Italian-speaking cultures	a. identify contributions of Italian-speaking cultures to own society and to global society	a. explore contributions of Italian-speaking cultures to own society and to global society	a. seek out and use opportunities to interact with members of Italian cultures; e.g., exchange letters with a pen pal

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

GC–2 affirming and valuing diversity

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
GC–2.1 awareness of first language	a. compare oral and written aspects of their first language and Italian b. identify some words in their first language that have been borrowed from Italian	a. identify some regional variations in their first language	a. identify aspects of their personal style in both speech and writing
GC–2.2 general language knowledge	a. recognize that languages can be grouped into families based on common origins b. identify how and why languages borrow from one another	a. recognize that languages may have regional differences in pronunciation, vocabulary or structure	a. describe ways languages evolve over time, and provide reasons for this evolution
GC–2.3 awareness of Canadian culture	a. identify some influences on the development of their personal identity	a. identify some of the past and present relationships between Italian cultures and their own; e.g., immigration, war, trade, travel	a. recognize ethnocentric elements in documents from their own culture
GC–2.4 general cultural knowledge	a. recognize some of the factors that affect the culture of a particular region	a. recognize that different cultures may have different interpretations of texts, cultural practices or products	a. recognize that within any culture there are important differences in the way people speak and behave
GC–2.5 valuing diversity	a. recognize and acknowledge different perspectives	a. recognize and acknowledge the value of different perspectives	a. seek out opportunities to interact with people from various cultures who have an interest in the Italian language and in Italian cultures
GC–2.6 intercultural skills	a. explore various strategies for interpersonal communication with people from different cultures	a. apply various strategies for interpersonal communication with people from different cultures	a. identify and use various strategies for interpersonal communication with people from different cultures

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Italian-speaking world.

GC–3 personal and career opportunities

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
GC–3.1 Italian language and Italian-speaking cultures	a. identify aspects of the history, literature, arts and crafts of Italian cultures that are of personal interest	a. identify some careers that use knowledge of the Italian language	a. explore opportunities for further education related to the Italian language and Italian-speaking cultures
GC–3.2 cultural and linguistic diversity	a. identify aspects of the history, literature, arts and crafts of different cultures that are of personal interest	a. identify some careers that use knowledge of international languages and cultures and that use intercultural skills	a. explore opportunities for further education related to languages and cultures

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Strategies

language learning

language use

Students will know and use various strategies to maximize the effectiveness of learning and communication.

general learning

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STRATEGIES

Under the Strategies heading are specific outcomes that will help students learn and communicate more **effectively**. Strategic competence has long been recognized as an important component of communicative competence. The learning outcomes that follow deal not only with compensation and repair strategies, important in the early stages of language learning when proficiency is low, but with strategies for language learning, language use in a broader sense, as well as general learning strategies that help students acquire content. Although people may use strategies unconsciously, the learning outcomes deal only with the **conscious use** of strategies.

The strategies are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands that show the development of awareness and skill in using strategies from course to course. Each strand, identified by a strand heading at the left end of the row, deals with a specific category of strategy. Language learning and general learning strategies are categorized as cognitive, metacognitive and social/affective. The language use strategies are organized by communicative mode: interactive, interpretive, productive.

The strategies that students choose depend on the task they are engaged in as well as on other factors, such as their preferred learning style, personality, age, attitude and cultural background. Strategies that work well for one person may not be effective for another person, or may not be suitable in a different situation. For this reason it is not particularly useful to say that students should be aware of, or able to use, a specific strategy in a particular course. Consequently, the specific outcomes describe the students' knowledge of, and ability to use, general types of strategies. More specific strategies for each general category or type are included in the sample list of strategies below. The specific strategies provided in the sample list **are not prescriptive** but are provided as an illustration of how the general strategies in the specific outcomes might be developed.

Teachers need to know and be able to demonstrate a broad range of strategies from which students are then able to choose in order to communicate effectively. Strategies of all kinds are best taught in the context of learning activities where students can apply them immediately and then reflect on their use.

SAMPLE LIST OF STRATEGIES

Language Learning Strategies

Cognitive

- listen attentively
- perform actions to match words of a song, story or rhyme
- learn short rhymes or songs, incorporating new vocabulary or sentence patterns
- imitate sounds and intonation patterns
- memorize new words by repeating them silently or aloud
- seek the precise term to express meaning
- repeat words or phrases in the course of performing a language task
- make personal dictionaries
- experiment with various elements of the language
- use mental images to remember new information
- group together sets of things—vocabulary, structures—with similar characteristics
- identify similarities and differences between aspects of the Italian language and own language
- look for patterns and relationships
- use previously acquired knowledge to facilitate a learning task
- associate new words or expressions with familiar ones, either in Italian or in own language
- find information, using reference materials like dictionaries, textbooks and grammars
- use available technological aids to support language learning; e.g., cassette recorders, computers
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember

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- place new words or expressions in a context to make them easier to remember
- use induction to generate rules governing language use
- seek opportunities outside of class to practise and observe
- perceive and note down unknown words and expressions, noting also their context and function
- be aware of cognates whose meanings vary in different languages

Metacognitive
- check copied writing for accuracy
- make choices about how you learn
- rehearse or role-play language
- decide in advance to attend to the learning task
- reflect on learning tasks with the guidance of the teacher
- make a plan in advance about how to approach a language learning task
- reflect on the listening, reading and writing process
- decide in advance to attend to specific aspects of input
- listen or read for key words
- evaluate own performance or comprehension at the end of a task
- keep a learning log
- experience various methods of language acquisition, and identify one or more considered to be particularly useful personally
- be aware of the potential of learning through direct exposure to the language
- know how strategies may enable coping with texts containing unknown elements
- identify problems that might hinder successful completion of a task, and seek solutions
- monitor own speech and writing to check for persistent errors
- be aware of own strengths and weaknesses, identify own needs and goals, and organize strategies and procedures accordingly

Social/Affective
- initiate or maintain interaction with others
- participate in shared reading experiences
- seek the assistance of a friend to interpret a text
- reread familiar self-chosen texts to enhance understanding and enjoyment
- work cooperatively with peers in small groups
- understand that making mistakes is a natural part of language learning
- experiment with various forms of expression, and note their acceptance or nonacceptance by more experienced speakers
- participate actively in brainstorming and conferencing as prewriting and postwriting exercises
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- repeat new words and expressions occurring in own conversations, and make use of these new words and expressions as soon as appropriate
- reduce anxiety by using mental techniques, such as positive self-talk or humour
- work with others to solve problems, and get feedback on tasks
- provide personal motivation by arranging own rewards when successful

Language Use Strategies

Interactive
- use words from own first language to get meaning across; e.g., use a literal translation of a phrase in the first language, use a first language word but pronounce it as in Italian
- acknowledge being spoken to
- interpret and use a variety of nonverbal cues to communicate; e.g., mime, pointing, gestures, drawing pictures
- indicate lack of understanding verbally or nonverbally; e.g., *scusi, mi dispiace, non ho capito*, raised eyebrows, blank look
- ask for clarification or repetition when something is not understood; e.g., *Che cosa vuoi dire?, Può ripetere, per favore?*
- use other speakers' words in subsequent conversations
- assess feedback from a conversation partner to recognize when a message has not been understood; e.g., raised eyebrows, blank look
- start again, using a different tactic, when communication breaks down; e.g., *Quello che cerco di dire è ...*

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- use a simple word similar to the concept to convey, and invite correction; e.g., *pesce* for *trota*
- invite others into the discussion
- ask for confirmation that a form used is correct; e.g., *Si può dire così*?
- use a range of fillers, hesitation devices and gambits to sustain conversations; e.g., *ma, veramente, dov'ero*
- use circumlocution to compensate for lack of vocabulary; e.g., *quello per appendere i panni* for *attaccapanni*
- repeat part of what someone has said to confirm mutual understanding; e.g., *Allora, quello che tu vuoi dire è ...*
- summarize the point reached in a discussion to help focus the talk
- ask follow-up questions to check for understanding; e.g., *Mi spiego*?
- use suitable phrases to intervene in a discussion; e.g., *parlando di ...*
- self-correct if errors lead to misunderstandings; e.g., *Quello che voglio dire è ...*

Interpretive

- use gestures, intonation and visual supports to aid comprehension
- make connections between texts on the one hand and prior knowledge and personal experience on the other
- use illustrations to aid reading comprehension
- determine the purpose of listening
- listen or look for key words
- listen selectively based on purpose
- make predictions about what is expected to be heard or read, based on prior knowledge and personal experience
- use knowledge of the sound–symbol system to aid reading comprehension
- infer probable meanings of unknown words or expressions from contextual clues
- prepare questions or a guide to note down information found in a text
- use key content words or discourse markers to follow an extended text
- reread several times to understand complex ideas
- summarize information gathered
- assess own information needs before listening, viewing or reading
- use skimming and scanning to locate key information in texts

Productive

- mimic what the teacher says
- use nonverbal means to communicate
- copy what others say or write
- use words visible in the immediate environment
- use resources to increase vocabulary
- use familiar repetitive patterns from stories, songs, rhymes or media
- use illustrations to provide detail when producing own texts
- use various techniques to explore ideas at the planning stage, such as brainstorming or keeping a notebook or log of ideas
- use knowledge of sentence patterns to form new sentences
- be aware of and use the steps of the writing process: prewriting (gathering ideas, planning the text, researching, organizing the text), writing, revision (rereading, moving pieces of text, rewriting pieces of text), correction (grammar, spelling, punctuation), publication (reprinting, adding illustrations, binding)
- use a variety of resources to correct texts; e.g., personal and commercial dictionaries, checklists, grammars
- take notes when reading or listening to assist in producing own text
- revise and correct final version of text
- use circumlocution and definition to compensate for gaps in vocabulary
- apply grammar rules to improve accuracy at the correction stage
- compensate for avoiding difficult structures by rephrasing

General Learning Strategies

Cognitive

- classify objects and ideas according to their attributes; e.g., red objects and blue objects, or animals that eat meat and animals that eat plants
- use models
- connect what is already known with what is being learned

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- experiment with and concentrate on one thing at a time
- focus on and complete learning tasks
- record key words and concepts in abbreviated form—verbal, graphic or numerical—to assist with performance of a learning task
- use mental images to remember new information
- distinguish between fact and opinion when using a variety of sources of information
- formulate key questions to guide research
- make inferences, and identify and justify the evidence on which these inferences are based
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember
- seek information through a network of sources, including libraries, the Internet, individuals and agencies
- use previously acquired knowledge or skills to assist with a new learning task

Metacognitive

- reflect on learning tasks with the guidance of the teacher
- choose from among learning options
- discover how own efforts can affect learning
- reflect upon own thinking processes and how you learn
- decide in advance to attend to the learning task
- divide an overall learning task into a number of subtasks
- make a plan in advance about how to approach a task
- identify own needs and interests
- manage own physical working environment
- keep a learning journal, such as a diary or a log
- develop criteria for evaluating own work
- work with others to monitor own learning
- take responsibility for planning, monitoring and evaluating learning experiences

Social/Affective

- watch others' actions and copy them
- seek help from others
- follow own natural curiosity and intrinsic motivation to learn
- participate in cooperative group learning tasks
- choose learning activities that enhance understanding and enjoyment
- be encouraged to try, even though mistakes might be made
- take part in group decision-making processes
- use support strategies to help peers persevere at learning tasks; e.g., offer encouragement, praise, ideas
- take part in group problem-solving processes
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- monitor own level of anxiety about learning tasks, and take measures to lower it if necessary; e.g., deep breathing, laughter
- use social interaction skills to enhance group learning activities

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
S–1.1 cognitive	a. identify and use a variety of cognitive strategies to enhance language learning; e.g., associate new words or expressions with familiar ones, either in Italian or in own language	a. select and use a variety of cognitive strategies to enhance language learning; e.g., find information, using reference materials like dictionaries, textbooks and grammars, use available technological aids to support language learning	a. select and use appropriate cognitive strategies to enhance language learning in a variety of situations; e.g., use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember
S–1.2 metacognitive	a. identify and use a variety of metacognitive strategies to enhance language learning; e.g., evaluate own performance or comprehension at the end of a task, keep a learning log	a. select and use a variety of metacognitive strategies to enhance language learning; e.g., experience various methods of language acquisition and identify one or more considered to be particularly useful personally	a. select and use appropriate metacognitive strategies to enhance language learning in a variety of situations; e.g., be aware of the potential of learning through direct exposure to the language, know how strategies may enable coping with texts containing unknown elements
S–1.3 social/affective	a. identify and use a variety of social and affective strategies to enhance language learning; e.g., seek help from others, get feedback on tasks	a. select and use a variety of social and affective strategies to enhance language learning; e.g., take risks, try unfamiliar tasks and approaches	a. select and use appropriate social and affective strategies to enhance language learning in a variety of situations; e.g., incorporate newly encountered words in subsequent conversations

Further examples of language learning strategies are available on pages 30 and 31.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–2 language use

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
S–2.1 interactive	a. identify and use appropriate interactive strategies to deal with specific communicative situations; e.g., invite others into discussions, ask for confirmation that a form used is correct	a. select and use a variety of interactive strategies; e.g., use a range of fillers, hesitation devices and gambits to sustain conversations, use circumlocution to compensate for lack of vocabulary	a. select and use appropriate interactive strategies in a variety of situations; e.g., repeat part of what someone has said to confirm mutual understanding, self-correct if errors lead to misunderstanding
S–2.2 interpretive	a. identify and use a variety of interpretive strategies; e.g., prepare questions or a guide to note down information found in a text	a. select and use a variety of interpretive strategies; e.g., use key content words or discourse markers to follow an extended text	a. select and use appropriate interpretive strategies in a variety of situations; e.g., reread several times to understand complex ideas
S–2.3 productive	a. identify and use a variety of productive strategies; e.g., be aware of and use the steps of the writing process	a. select and use a variety of productive strategies; e.g., take notes when reading or listening to assist in producing own text	a. select and use appropriate productive strategies in a variety of situations; e.g., use a variety of resources to correct texts, apply grammar rules to increase accuracy

Further examples of language use strategies are available on pages 31 and 32.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–3 general learning

	Italian Language and Culture 10-6Y	Italian Language and Culture 20-6Y	Italian Language and Culture 30-6Y
	Students will be able to:		
S–3.1 cognitive	a. identify and use a variety of cognitive strategies to enhance general learning; e.g., use mental images to remember new information	a. select and use a variety of cognitive strategies to enhance general learning; e.g., formulate key questions to guide research	a. select and use appropriate cognitive strategies to enhance general learning in a variety of situations; e.g., seek information through a network of sources, including libraries, the Internet, individuals and agencies
S–3.2 metacognitive	a. identify and use a variety of metacognitive strategies to enhance general learning; e.g., set up an environment favourable to learning	a. select and use a variety of metacognitive strategies to enhance general learning; e.g., keep a learning journal such as a diary or a log	a. select and use appropriate metacognitive strategies to enhance general learning in a variety of situations; e.g., take responsibility for planning, monitoring and evaluating learning experiences
S–3.3 social/affective	a. identify and use a variety of social and affective strategies to enhance general learning; e.g., use encouragement and praise to help peers	a. select and use a variety of social and affective strategies to enhance general learning; e.g., take part in group problem-solving processes	a. select and use appropriate social and affective strategies to enhance general learning in a variety of situations; e.g., take risks, try unfamiliar tasks and approaches

Further examples of general learning strategies are available on pages 32 and 33.

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SPANISH LANGUAGE AND CULTURE 10-3Y, 20-3Y, 30-3Y

This Spanish Language and Culture Three-year (3Y) Program is intended for students who are beginning their study of Spanish language and culture in senior high school.

INTRODUCTION

Over 350 million people in the world speak Spanish. It is the official language of the following countries: Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Equatorial Guinea, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Spain, Uruguay and Venezuela. It is also spoken in many other countries in which it is not the official language, including the United States of America and the Philippines. It is one of the most widely spoken languages in the world.

The value of learning the Spanish language is enormous for Alberta society as a whole. Apart from the common advantages related to the learning of an international language, it permits an insight into the rich and varied cultures developed in the Spanish-speaking world and bestows more opportunity to communicate directly with Spanish-speaking people. As well, for some students with a prior knowledge of the language and cultures, it offers an opportunity for renewed contact. It contributes to maintaining and developing literacy for those whose first language is Spanish.

The learning of Spanish, as any other language, develops awareness of, and sensitivity to, cultural and linguistic diversity. This fact, in addition to preserving cultural identity, is also a means of cultural enrichment and is the best means of fostering understanding and solidarity among peoples and countries. Furthermore, it gives individuals the opportunity to identify, question and challenge their own cultural assumptions, values and perspectives and to contribute positively to society.

There is also significant evidence to suggest that learning another language contributes to the development of increased grammatical abilities in the first language and enhances cognitive functioning. Learning a second language increases the ability to conceptualize and to think abstractly; and it fosters more cognitive flexibility, greater divergent thinking, creativity and metalinguistic competence.

Moreover, in today's world, the knowledge of a second language and culture in general is a benefit for individuals, providing skills that enable them to communicate and interact effectively in the global marketplace and workplace. Given the important economic role the Spanish-speaking countries are playing in the international market, and given their increasing trading partnership with Alberta, the learning of Spanish provides an important economic advantage.

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ASSUMPTIONS

The following statements are assumptions that have guided the development process of this program of studies.

- Language is communication.
- All students can be successful learners of language and culture, although they will learn in a variety of ways and acquire proficiency at varied rates.
- All languages can be taught and learned.
- Learning Spanish as a second language leads to enhanced learning in both the student's primary language and in related areas of cognitive development and knowledge acquisition. This is true of students who come to the class with some background knowledge of Spanish and develop literacy skills in the language. It is also true for students who have no cultural or linguistic background in Spanish and are studying Spanish as a second language.

THE CONCEPTUAL MODEL

The aim of this program of studies is the development of communicative competence in Spanish.

Four Components

For the purposes of this program of studies, communicative competence is represented by four interrelated and interdependent components.

Applications deal with what the students will be able to do with the language, the functions they will be able to perform and the contexts in which they will be able to operate.

Language Competence addresses the students' knowledge of the language and their ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used.

Global Citizenship aims to develop intercultural competence, with a particular focus on cultures of the Spanish-speaking world.

Strategies help students learn and communicate more effectively and more efficiently.

Each of these components is described more fully at the beginning of the corresponding section of this program of studies.

Modes of Communication

Because of the focus on using language to communicate in specific contexts, with a particular purpose or task in mind, three modes of communication are used to organize some of the specific outcomes.

Interaction is most often direct, face-to-face oral communication, but it can take the form of written communication between individuals, using a medium such as e-mail where the exchange of information is fairly immediate. It is characterized principally by the opportunity to actively negotiate meaning; that is, helping others understand and working to understand others. Interactive communication generally requires more speed but less accuracy than the other two modes.

Interpretation is receptive communication of oral and written messages in contexts where the listener or reader is not in direct contact with the creator of the message. While there is no opportunity to ask for clarification, there is sometimes the possibility of rereading or listening again, consulting references, or making the meaning clearer in other ways. Reading and listening will sometimes involve **viewing** and interpreting visual elements, such as illustrations in books or moving images in television and film. Interpretation goes beyond a literal comprehension to include an understanding of some of the unspoken or unwritten meaning intended by the speaker or author.

Production is communication of oral and written messages in contexts where the audience is not in personal contact with the speaker or writer, or in situations of one-to-many communication; e.g., a lecture or a performance where there is no opportunity for the listener to interact with the speaker. Oral and written presentations will

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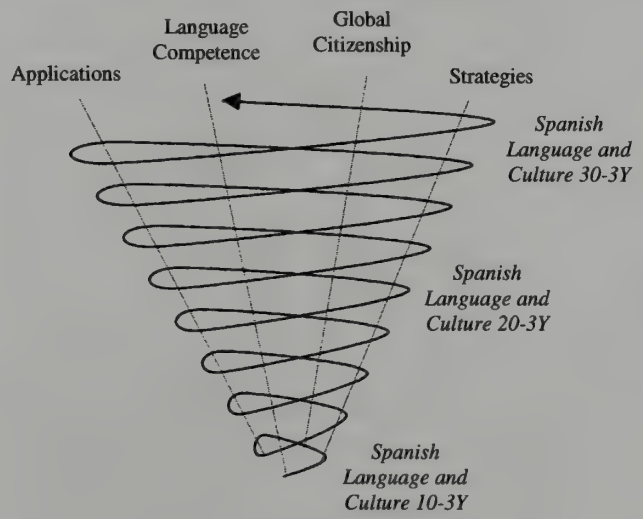
sometimes be enhanced by **representing** the meaning visually, using pictures, diagrams, models, drama techniques or other nonverbal forms of communication. Greater knowledge of the language and culture is required to ensure that communication is successful, since the participants cannot directly negotiate meaning.

A Spiral Progression

Language learning is integrative, not merely cumulative. Each new element that is added must be integrated into the whole of what has gone before. The model that best represents the students' language learning progress is an expanding spiral. Their progression is not only vertical (e.g., increased proficiency) but also horizontal (e.g., broader range of applications and experience with more text forms, contexts and so on). The spiral also represents how language learning activities are best structured. Particular lexical fields, learning strategies or language functions, for example, are revisited at different points in the program, but from a different perspective, in broader contexts or at a slightly higher level of proficiency each time. Learning is reinforced, extended and broadened with each successive pass.



ORGANIZATION OF THE PROGRAM OF STUDIES

General Outcomes

General outcomes are broad statements identifying the knowledge, skills and attitudes that students are expected to achieve in the course of their language learning experience. The four general outcomes serve as the foundation for this program of studies and are based on the conceptual model outlined above.

Applications [A]

- Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

Language Competence [LC]

- Students will use Spanish **effectively** and **competently**.

Global Citizenship [GC]

- Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

Strategies [S]

- Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

The order in which the general outcomes are presented in the program of studies does not represent a sequential order, nor does it indicate the relative importance of each component. The general outcomes are to be implemented in an integrated manner.

Specific Outcomes

Each general outcome is further broken down into specific outcomes that students are to achieve by the end of each course. The specific outcomes are interrelated and interdependent. In most classroom activities, a number of learning outcomes will be dealt with in an integrated manner.

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The specific outcomes are categorized under cluster headings, which show the scope of each of the four general outcomes. These headings are shown in the table on the following page.

The specific outcomes are further categorized by strands, which show the developmental flow of learning from the beginning to the end of the program. However, an outcome for a particular course will not be dealt with only in that particular year of the program. The spiral progression that is part of the conceptual model means that activities in the years preceding will prepare the ground for acquisition and in the years following will broaden applications.

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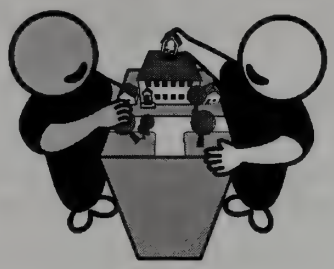
General Outcomes

Applications



Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information
A–2 to express emotions and personal perspectives
A–3 to get things done
A–4 to extend their knowledge of the world
A–5 for imaginative purposes and personal enjoyment
A–6 to form, maintain and change interpersonal relationships

Language Competence

Students will use Spanish **effectively** and **competently**.

LC–1 attend to form
LC–2 interpret and produce oral texts
LC–3 interpret and produce written texts
LC–4 apply knowledge of the sociocultural context
LC–5 apply knowledge of how text is organized, structured and sequenced in Spanish

Global Citizenship

Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

GC–1 historical and contemporary elements of Spanish-speaking cultures
GC–2 affirming diversity
GC–3 personal and career opportunities

Strategies

Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning
S–2 language use
S–3 general learning

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Guide to Reading the Program of Studies

General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

cluster heading for specific outcomes

LC–2 interpret and produce oral texts

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
LC–2.1 aural interpretation	a. understand a series of simple sentences in guided situations	a. understand short, simple texts in guided and unguided situations	a. understand short texts on unfamiliar topics in guided situations and short texts on familiar topics in unguided situations
LC–2.2 oral interpretation	a. produce simple words and phrases in guided situations	a. produce short, simple texts in guided situations	a. produce short texts on a variety of topics, providing some details to support the main point, in guided situations
LC–2.3 interactive fluency	a. engage in simple interactions, using short, isolated lexical phrases	a. engage in simple interactions, using a combination of sentences	a. manage short interactions easily, with pauses for planning and repair

read each page vertically for outcomes expected at the end of each course

strand headings for specific outcomes

specific outcome statements for each course

read each page horizontally for developmental flow of outcomes from course to course

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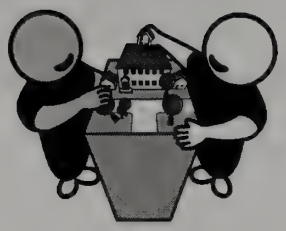

Applications

to express emotions and personal perspectives

to receive and impart information

to get things done

Students will use Spanish in a variety of situations and for a variety of purposes.

to extend their knowledge of the world

to form, maintain and change interpersonal relationships

for imaginative purposes and personal enjoyment

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APPLICATIONS

The specific outcomes under the heading Applications deal with **what** the students will be able to do with the Spanish language; that is, the **functions** they will be able to perform and the **contexts** in which they will be able to operate.

The functions are grouped under six cluster headings—see the illustration on the preceding page. Under each of these headings there are one or more strands, which show the developmental flow of learning from course to course. Each strand, identified by a strand heading at the left end of a row, deals with a specific language function; e.g., share factual information. Students at any grade level will be able to share factual information. Beginning learners will do this in very simple ways. As students gain more knowledge and experience, they will broaden the range of subjects they can deal with, they will learn to share information in writing as well as orally, and they will be able to handle formal and informal situations.

Different models of communicative competence have organized language functions in a variety of ways. The organizational structure chosen here reflects the needs and interests of students in a classroom where activities are focused on meaning and are interactive. For example, the strand entitled "manage group actions" has been included to ensure that students acquire the language necessary to function independently in small groups, since this is an effective way of organizing second language classrooms. The strands under the cluster heading "to extend their knowledge of the world" will accommodate a content-based approach to language learning where students learn content from another subject area as they learn the Spanish language.

The level of linguistic, sociolinguistic and discourse competence that students will exhibit when carrying out the functions is defined in the specific outcomes for Language Competence for each course. To know how well students will be able to perform the specific function, the Applications outcomes must be read in conjunction with the Language Competence outcomes.

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General Outcome for Applications
Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
A–1.1 share factual information	a. identify concrete people, places and things b. ask for and provide basic information c. respond to simple, predictable questions	a. ask for and provide information on a range of familiar topics b. describe people, places, things and series, or sequences of events or actions	a. provide information on several aspects of a topic; e.g., give a simple report b. understand and use definitions, comparisons and examples

A–2 to express emotions and personal perspectives

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
A–2.1 share ideas, thoughts, opinions, preferences	a. express a personal response and simple preferences b. identify favourite people, places or things	a. express a personal response to a variety of situations b. inquire about and express preferences c. record and share thoughts and ideas with others	a. inquire about and express agreement and disagreement, approval and disapproval, interest or lack of interest, satisfaction and dissatisfaction b. state and support a point of view
A–2.2 share emotions, feelings	a. respond to and express emotions and feelings in familiar contexts b. identify emotions and feelings	a. inquire about, respond to and express emotions and feelings in a variety of familiar contexts b. record and share personal experiences involving an emotion or feeling	a. inquire about, express and respond to a variety of emotions and feelings b. compare the expression of emotions and feelings in a variety of informal situations

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General Outcome for Applications
Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

A–3 to get things done

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
A–3.1 guide actions of others	a. indicate basic needs and wants b. ask for permission c. give and respond to simple oral instructions or commands d. suggest a course of action, and respond to a suggestion	a. make and respond to a variety of simple requests b. seek, grant or withhold permission c. relay simple messages d. encourage or discourage others from a course of action e. give and follow a simple sequence of instructions	a. make and respond to suggestions in a variety of situations b. give and respond to advice and warnings
A–3.2 state personal actions	a. respond to offers, invitations and instructions b. ask or offer to do something c. indicate choice from among several options	a. express a wish or a desire to do something b. make an offer or an invitation, and respond to offers and invitations made by others c. inquire about and express ability and inability to do something	a. state personal actions in the past, present or future b. make a promise and express intention in a variety of situations
A–3.3 manage group actions	a. manage turn taking b. encourage other group members to act appropriately c. ask for help or clarification of what is being said or done in the group	a. suggest, initiate or direct action in group activities b. encourage other group members to participate c. assume a variety of roles and responsibilities as group members d. negotiate in a simple way with peers in small-group tasks e. offer to explain or clarify	a. check for agreement and understanding b. express disagreement in an appropriate way c. express appreciation, enthusiasm, support and respect for contributions of others

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General Outcome for Applications
Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

A–4 to extend their knowledge of the world

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
A–4.1 discover and explore	a. investigate the immediate environment	a. make and talk about personal observations b. explore classification systems and criteria for categories c. discover relationships and patterns	a. ask questions to gain knowledge and clarify understanding b. explore meaning in a variety of ways; e.g., by drawing a diagram, making a model, rephrasing
A–4.2 gather and organize information	a. gather simple information b. organize items in different ways c. sequence items in different ways	a. record and share personal knowledge of a topic b. compare and contrast items in simple ways c. compose questions to guide research d. identify sources of information e. record observations	a. gather information from a variety of resources b. organize and manipulate information; e.g., transform information from texts into other forms, such as tables, diagrams, story maps and flow charts
A–4.3 solve problems	a. experience problem-solving situations in the classroom b. choose between alternative solutions	a. recognize and describe a problem, then propose solutions b. understand and use the steps in the problem-solving process	a. describe and analyze a problem, then propose solutions b. generate and evaluate alternative solutions to problems
A–4.4 explore opinions and values	a. listen attentively to the opinions expressed b. respond sensitively to the ideas and products of others c. make connections between behaviour and values	a. express their views on a variety of topics within their direct experience b. gather opinions on a topic within their direct experience c. recognize differences of opinion	a. explore how values influence behaviour; e.g., describe characters and their motivations in a story b. provide reasons for their position on an issue

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General Outcome for Applications
Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

A–5 for imaginative purposes and personal enjoyment

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
A–5.1 humour/fun	a. use the language for fun; e.g., learn simple riddles, jingles and humorous songs	a. use the language for fun and to interpret humour; e.g., simple amusing texts	a. use the language for fun and to interpret and express humour; e.g., interpret figures of speech literally, using illustrations or short skits
A–5.2 creative/aesthetic purposes	a. use the language creatively	a. use the language creatively and for aesthetic purposes; e.g., write poems based on simple, repetitive and modelled language	a. use the language creatively and for aesthetic purposes
A–5.3 personal enjoyment	a. use the language for personal enjoyment; e.g., listen to favourite music	a. use the language for personal enjoyment; e.g., listen to favourite songs in Spanish, play games alone or with friends	a. use the language for personal enjoyment; e.g., find a personal pen pal and exchange letters

A–6 to form, maintain and change interpersonal relationships

	Students will be able to:		
A–6.1 manage personal relationships	a. exchange greetings and farewells	a. apologize and refuse politely	a. initiate and participate in casual exchanges with classmates
	b. address a new acquaintance and introduce themselves	b. talk about themselves, and respond to the talk of others by showing attention and interest	b. use routine means of interpersonal communications; e.g., telephone calls, personal notes, e-mail messages
	c. exchange some basic personal information—name, age	c. make and break social engagements	
	d. initiate relationships		

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Language Competence

attend to form

interpret and produce oral texts

interpret and produce written texts

Students will use Spanish effectively and competently.

apply knowledge of the sociocultural context

apply knowledge of how text is organized, structured and sequenced in Spanish

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LANGUAGE COMPETENCE

Language competence is a broad term that includes linguistic or grammatical competence, discourse competence, sociolinguistic or sociocultural competence, and what might be called textual competence. The specific outcomes under Language Competence deal with knowledge of the language and the ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used. Language competence is best developed in the context of activities or tasks where the language is used for real purposes; in other words, in practical **applications**.

The various components of language competence are grouped under five cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of language competence. For example, under the cluster heading "attend to form," there is a strand for phonology (pronunciation, stress, intonation), orthography (spelling, mechanical features), lexicon (vocabulary words and phrases) and grammatical elements (syntax and morphology).

Although the outcomes isolate these individual aspects, language competence should be developed through classroom activities that focus on meaningful uses of the language and on **language in context**. Tasks will be chosen based on the needs, interests and experiences of students. The vocabulary, grammar structures, text forms and social conventions necessary to carry out a task will be taught, practised and assessed as students are involved in various aspects of the task itself, **not in isolation**.

Strategic competence is often closely associated with language competence, since students need to learn ways to compensate for low proficiency in the early stages of learning if they are to engage in authentic language use from the beginning. This component is included in the language use strategies in the Strategies section.

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

LC–1 attend to form

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
LC–1.1 phonology	a. pronounce some common words and phrases comprehensibly b. use intonation to express meaning c. distinguish particular sounds of the language	a. use comprehensible pronunciation, stress and intonation when producing words or phrases b. recognize some of the effects that intonation and stress have in different situations c. identify and reproduce some critical sound distinctions that are important for meaning	a. produce the sounds, stress, rhythm and intonation patterns of the Spanish language consistently and accurately
LC–1.2 orthography	a. relate all letters of the alphabet to the sounds they represent b. use spelling patterns and mechanical conventions correctly; e.g., capitalization, punctuation	a. recognize the role that accentuation plays in the Spanish language	a. apply spelling rules and mechanical conventions consistently and accurately

(continued)

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

(continued)

LC–1 attend to form

Students will be able to:

LC–1.3 lexicon

Spanish Language and Culture 10-3Y

a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including:
- people around me
  - greetings
  - personal information
  - people and description
  - professions/occupations
  - clothing
  - the body
  - family and friends
- school
  - school facilities
  - in the classroom
  - time and calendar
- activities
  - in the home
  - in the community—places, transportation, weather
  - favourite activities
- celebrations—personal introduction to Spanish-speaking world (geography)
- any other lexical fields that meet their needs and interests

Spanish Language and Culture 20-3Y

a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including:
- foods—restaurants, market
- shopping, fashion and fads
- sports and exercise
- vacations and travel
- social life
- health and safety (physical states/visit to the doctor)
- daily routine
- introduction to cultural diversity in the Spanish-speaking world
- any other lexical fields that meet their needs and interests

Spanish Language and Culture 30-3Y

a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including:
- arts, entertainment and literature
- music
- relationships (friends/clubs/activities/sports/hobbies)
- celebrations (cultural)
- driving
- folk tales, legends and fables
- children's games/childhood activities
- technology
- the world of work
- the environment
- any other lexical fields that meet their needs and interests

b. recognize that one word may have multiple meanings, depending on the context, and that various words and expressions may express the same idea

(continued)

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

(continued)

LC–1 attend to form

LC–1.4 grammatical elements

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
a.	use, in modelled situations,[1] the following grammatical elements:		
	• *me/te/le* • *nos/les/os gusta (n)* • pronouns after prepositions: *mí, ti, él, ella, usted, nostros/as, vosotros/as, ellos/as, ustedes* • adverbs ending in *mente* • *caer bien/mal* • commonly used verbs: *querer, ir, hacer, poder, venir, salir, jugar, saber* • possessive adjectives: *mi, tu, su, mis, tus, sus, nuestro/a (s), vuestro/a (s)* • demonstrative adjectives and pronouns: *este/a, ese/a, aquel/la, estos/as, esos/as, aquellos/as* • affirmative commands (*tú* and *ustedes/vosotros* forms, for commonly used verbs) • affirmative and negative expressions: *alguien, nadie, algo, nada, también* • reflexive verbs • present progressive (*estar* + gerund)	• irregular verbs in present tense: *conocer, saber, dar, poner, traer, preferir* • preterite • imperfect • perfect tense • simple future • direct object pronouns • *por/para* • *hace*, expressions of time • personal *a* • impersonal *se*	• possessive pronouns: *mío/mía, tuyo/tuya, suyo/suya, míos/mías, tuyos/tuyas, suyos/suyas* • indirect object pronouns • comparative, superlative, diminutive • impersonal *se* • preterite vs. imperfect • conditional • subjunctive mood • present subjunctive: – to express persuasion: *aconsejar, decir, sentir* – to express emotion: *alegrarse, sentir* – to express doubt – after impersonal expressions: *es una lastima que ..., es necesario que ...* – to express wishes and hope: *Ojalá que ..., Quiero que ...* – after adverbial conjunctions such as *cuando* and *aunque* • negative commands • irregular commands with *tú*

(continued)

1. Modelled Situations: This term is used to describe learning situations where a model of specific linguistic elements is consistently provided and immediately available. Students in such situations will have an emerging awareness of the linguistic elements and will be able to apply them in very limited situations. Limited fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

(continued)

LC–1 attend to form

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
LC–1.4 grammatical elements	b. use, in structured situations,[2] the following grammatical elements:		
	• affirmative/negative/ interrogative sentences in the present tense • regular *–ar, –ir, –er* verbs in the present tense • gender and number of nouns, adjectives • commonly used verbs: *ser, estar, tener, ser* vs. *estar* • *tener que* + infinitive • *ir* + *a* + infinitive (immediate future) • definite and indefinite articles: *el, la, los, las, un, una, unas, unos*	• *me/te/le* • *nos/les/os gusta(n)* • *caer bien/mal* • commonly used verbs: *querer, ir, hacer, poder, venir, salir, jugar, saber* • *tener que* + infinitive • *ir* + *a* + infinitive (immediate future) • definite and indefinite articles: *el, la, los, las, un, una, unas, unos* • possessive adjectives: *mi, tu, su, mis, tus, sus, nuestro/a (s), vuestro/a (s)* • adverbs ending in *mente* • demonstrative adjectives and pronouns: *este/a, ese/a, aquel/la, estos/as, esos/as, aquellos/as* • affirmative commands (*tú* and *ustedes* forms, for commonly used verbs) • affirmative and negative expressions: *alguien, nadie, algo, nada, también* • reflexive verbs • present progressive (*estar* + gerund) • pronouns after prepositions: *mí, ti, él, ella, usted, nostros/as, vosotros/as, ellos/as, ustedes*	• irregular verbs in present tense: *conocer, saber, dar, poner, traer, preferir* • preterite • imperfect • perfect tense • simple future • direct object pronouns • *por/para* • *hace*, expressions of time • personal *a* • impersonal *se*

(continued)

2. Structured Situations: This term is used to describe learning situations where a familiar context for the use of specific linguistic elements is provided and students are guided in the use of these linguistic elements. Students in such situations will have increased awareness and emerging control of the linguistic elements and will be able to apply them in familiar contexts with teacher guidance. Student language is characterized by increasing fluency and confidence.

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

(continued)

LC–1 attend to form

Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
Students will be able to:		
c. use, independently and consistently,[3] the following grammatical elements:		
• subject pronouns: *yo, tú, él, ella, usted, nosotros/as, vosotros/as, ustedes* • singular pronouns (*yo, tú, él, ella*) with regular verbs • first, second and third person singular forms of regular verbs • affirmative and negative sentences	• interrogative sentences in the present tense • regular verbs in all persons in the present tense • gender and number of nouns, adjectives • commonly used verbs: *ser, estar, tener*	• *me/te/le* • *nos/les/os gusta (n)* • commonly used verbs in present tense: *querer, ir, hacer, poder, conocer, saber, venir, salir, decir, preferir* • *tener que* + infinitive • *ir + a* + infinitive (immediate future) • possessive adjectives: *mi, tu, su, mis, tus, sus, nuestros/as, vuestros/as* • demonstrative adjectives and pronouns: *este/a, ese/a, aquel/la, estos/as, esos/as, aquellos/as* • adverbs ending in *mente* • reflexive verbs • present progressive (*estar* + gerund) • commands (*tú* form—regular verbs) • commands (*usted, ustedes*) for commonly used verbs • pronouns after prepositions: *mí, ti, él, ella, usted, nostros/as, vosotros/as, ellos/as, ustedes* • affirmative and negative expressions: *alguien, nadie, algo, nada, también*

LC–1.4
grammatical elements

3. Independently and Consistently: This term is used to describe learning situations where students use specific linguistic elements in a variety of contexts with limited teacher guidance. Students in such situations will have consistent control of the linguistic elements and will be able to apply them in a variety of contexts with limited teacher guidance. Fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

LC–2 interpret and produce oral texts

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
LC–2.1 aural interpretation	a. understand a series of simple spoken sentences in guided situations	a. understand short, simple oral texts in guided and unguided situations	a. understand short oral texts on unfamiliar topics in guided situations and short oral texts on familiar topics in unguided situations
LC–2.2 oral production	a. produce simple words and phrases, orally, in guided situations	a. produce short, simple oral texts in guided situations	a. produce short oral texts on a variety of topics, providing some details to support the main point, in guided situations
LC–2.3 interactive fluency	a. engage in simple interactions, using short, isolated lexical phrases	a. engage in simple interactions, using a combination of sentences	a. manage short interactions easily, with pauses for planning and repair

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

LC–3 interpret and produce written texts

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
LC–3.1 written interpretation	a. understand a series of simple written sentences in guided situations	a. understand the main point and some supporting details of written texts on familiar topics in guided situations	a. understand the main point and specific details of written texts on a variety of topics in guided situations
LC–3.2 written production	a. write phrases and short, simple sentences in guided situations	a. write short, simple texts in guided situations	a. write short, simple texts on a variety of topics, providing some details to support the main point, in guided situations
LC–3.3 viewing	a. derive meaning from a variety of visuals and other forms of nonverbal communication in guided situations	a. derive meaning from the visual elements of a variety of media in guided and unguided situations	a. identify the purposes, intended audience, messages and points of view in a variety of visual media, in guided situations
LC–3.4 representing	a. use a variety of visuals and other forms of nonverbal communication to express meaning in guided situations	a. express meaning through the use of visual elements in a variety of media in guided and unguided situations	a. express meaning through the use of multiple visual elements in a variety of media in guided situations

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

LC–4 apply knowledge of the sociocultural context

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
LC–4.1 register	a. distinguish between formal and informal situations, and use simple forms in formal and informal situations with guidance; e.g., *usted, tú*	a. identify differences between formal and informal registers in a variety of situations b. use formal and informal language in familiar situations	a. explore formal and informal uses of language in a variety of contexts b. adjust language to suit audience and purpose
LC–4.2 idiomatic expressions	a. understand and use some simple idiomatic expressions as set phrases	a. use learned idiomatic expressions to enhance communication	a. use learned idiomatic expressions in a variety of contexts
LC–4.3 variations in language	a. identify variations in language b. experience a variety of voices c. acknowledge individual differences in speech	a. experience a variety of accents, variations in speech and regional variations in language	a. recognize other influences resulting in variations in language; e.g., age, gender, social class
LC–4.4 social conventions	a. imitate simple, routine social interactions b. use basic social expressions appropriate to the classroom c. use basic politeness conventions	a. use appropriate oral forms of address for people frequently encountered b. recognize verbal behaviours that are considered impolite c. recognize important social conventions in everyday interactions; e.g., shaking hands, hugging, kissing	a. interpret the use of common social conventions in oral and written texts, in guided situations
LC–4.5 nonverbal communication	a. understand the meaning of and imitate some common nonverbal behaviours used in the Spanish-speaking world; e.g., nodding and shaking head b. experiment with using some simple nonverbal means of communication	a. recognize appropriate nonverbal behaviours in a variety of familiar contexts; e.g., eye contact, interpersonal space, physical contact b. recognize that some nonverbal behaviours may be inappropriate in certain contexts; e.g., wearing a baseball cap indoors	a. interpret and use a variety of forms of nonverbal communication with guidance; e.g., gestures

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

LC–5 apply knowledge of how text is organized, structured and sequenced in Spanish

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
LC–5.1 cohesion/coherence	a. link words or groups of words in simple ways; e.g., *y, pero, también* b. link a sequence of sentences in an organized fashion	a. link sentences with simple cohesion markers; e.g., *además, primero, por ultimo* b. link several sentences coherently; e.g., on a single theme c. use common conventions to structure texts; e.g., titles, paragraphs	a. organize texts, using common patterns; e.g., cause and effect, straightforward time sequencing b. interpret simple references within texts; e.g., pronouns, demonstratives c. organize texts to indicate steps in a procedure or directions to follow
LC–5.2 text forms	a. experience a variety of text forms b. recognize some simple text forms; e.g., lists, letters, stories, songs	a. recognize a variety of text forms delivered through a variety of media; e.g., videotaped instructions, reports with visuals b. use some simple text forms in their own productions; e.g., maps, questionnaires	a. identify the organizational structure of a variety of text forms; e.g., folk tales, newspaper articles, instructions for a game b. apply knowledge of a variety of text forms to own productions
LC–5.3 patterns of social interaction	a. initiate and respond to social interaction patterns in guided situations; e.g., question–answer	a. use simple conventions to open and close conversations and manage turn taking b. initiate and respond using a variety of social interaction patterns; e.g., question–answer, request–acceptance or nonacceptance	a. combine simple social interaction patterns to initiate and perform transactions and interactions; e.g., accept/decline invitations and give explanations

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Global Citizenship

historical and contemporary elements of Spanish-speaking cultures

affirming diversity

Students will acquire the knowledge, skills and attitudes to be effective global citizens, through the exploration of the cultures of the Spanish-speaking world.

personal and career opportunities

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GLOBAL CITIZENSHIP

The learning outcomes for Global Citizenship deal with the development of intercultural competence, encompassing some of the knowledge, skills and attitudes that students need in order to be effective global citizens. The concept of global citizenship encompasses citizenship at all levels, from the local school and community to Canada and the world.

The various components of global citizenship are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of intercultural competence. For example, under the cluster heading "historical and contemporary elements of Spanish-speaking cultures," there are strands for the processes and methods of acquiring knowledge about Spanish-speaking cultures, the cultural knowledge thus acquired, applications of that knowledge to aid comprehension and to communicate in appropriate ways, positive attitudes toward Spanish-speaking cultures, as well as knowledge of the diversity within those cultures.

Developing cultural knowledge and skills is a lifelong process. Knowledge of one's own culture is acquired over a lifetime. Cultures change over time. Within any national group, there may be a dominant culture or cultures and a number of minority cultures. Rather than developing a bank of knowledge about the Spanish-speaking cultures, it is more important for students to develop skills in accessing and understanding information about culture and in applying that knowledge for the purposes of interaction and communication. Students will gain cultural knowledge in the process of developing these skills. In this way, if they encounter elements of the culture they have not learned about in class, they will have the skills and abilities to deal with them effectively and appropriately.

The "affirming diversity" heading covers knowledge, skills and attitudes that are developed as a result of bringing other languages and cultures into relationship with one's own. There is a natural tendency when learning a new language and culture to compare it with what is familiar. Many students leave a second language learning experience with a heightened awareness and knowledge of their own language and culture. They will also be able to make some generalizations about languages and cultures based on their experiences and those of their classmates, who may have a variety of cultural backgrounds. This will provide students with an understanding of diversity within both a global and a Canadian context.

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

GC–1 historical and contemporary elements of Spanish-speaking cultures

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
GC–1.1 accessing/analyzing cultural knowledge of the Spanish-speaking world	a. ask questions and make observations about elements of Spanish-speaking cultures, using their first language	a. use basic research skills to find out about Spanish-speaking cultures; e.g., formulate questions about patterns of behaviour or interactions typical of their peers in Spanish-speaking cultures b. compare and make connections between some elements of the Spanish-speaking cultures being studied and their own	a. seek out, organize and analyze information about Spanish-speaking cultures from a variety of sources; e.g., individuals, texts and media
GC–1.2 knowledge of Spanish-speaking cultures	a. participate in activities and experiences that reflect elements of Spanish-speaking cultures b. identify places in the world where Spanish is spoken	a. identify some things they have in common with people their own age who live in Spanish-speaking cultures b. explore some elements of Spanish-speaking cultures	a. explore and identify some elements of Spanish-speaking cultures; e.g., historical events and their influence on contemporary ways of life and cultural values b. identify and analyze the impact of the Spanish-speaking cultures on global society
GC–1.3 applying cultural knowledge	a. identify elements of the Spanish-speaking cultures in the local community b. use knowledge of geography to understand some elements of Spanish-speaking cultures	a. identify commonalities and differences between the Spanish-speaking cultures and their own; and apply knowledge of the cultures to interpret these commonalities and differences	a. apply knowledge of the role of contemporary Spanish-speaking cultures in global society to enhance interpersonal relations in a variety of contexts and to interpret texts

(continued)

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

(continued)

GC–1 historical and contemporary elements of Spanish-speaking cultures

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
GC–1.4 diversity within Spanish-speaking cultures	a. experience diverse elements of the Spanish-speaking cultures; e.g., music, clothing, food	a. identify and explore commonalities and differences between diverse groups within Spanish-speaking cultures; e.g., differences between urban and rural ways of life, ethnic backgrounds	a. understand major factors that influence the diversity of Spanish-speaking cultures
	b. identify some elements that reflect diversity within Spanish-speaking cultures; e.g., rock and folk music		b. apply knowledge of the role of different elements of contemporary Spanish-speaking cultures in global society to enhance interpersonal relations in a variety of contexts and to interpret texts
GC–1.5 valuing Spanish-speaking cultures	a. show a willingness to participate in cultural activities and experiences related to Spanish-speaking cultures	a. express an interest in finding out about people their own age who speak Spanish	a. choose to participate in and contribute to activities and experiences that reflect Spanish-speaking cultures; e.g., see a Spanish-language movie, attend a cultural event related to Spanish-speaking cultures

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

GC–2 affirming diversity

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
GC–2.1 awareness of first language	a. recognize similarities between their first language and Spanish; e.g., cognates	a. identify similarities and differences between their first language and Spanish; e.g., basic word order, social conventions	a. compare oral and written aspects of their first language and Spanish b. identify some words in their first language that have been borrowed from Spanish
GC–2.2 general language knowledge	a. recognize that languages can be grouped into families based on common origins b. explore the variety of languages spoken by those around them	a. know that within a linguistic group, people can have different words for the same thing b. recognize that languages may have regional differences in such things as pronunciation, vocabulary and structure	a. identify how and why languages borrow from one another b. make generalizations about the systematic nature of language c. recognize that languages evolve over time
GC–2.3 awareness of own culture	a. explore and recognize similarities between their own culture and other cultures; e.g., celebrations, food, roles of family members	a. make connections between individuals or situations in texts and their own personal experiences b. recognize and identify similarities and differences between their own culture and other cultures	a. recognize some influences on the development of their personal identity b. identify shared references and the different connotations attached to them in their own culture and other cultures; e.g., Christmas, Easter
GC–2.4 general cultural knowledge	a. recognize that culture is expressed through a variety of forms; e.g., stories, art forms, crafts, music b. recognize that geography, climate and history affect the culture of a particular region	a. recognize that speakers of the same language may come from different cultural backgrounds	a. recognize that within any culture there are important differences in the way people interact b. recognize that diversity exists within any culture

(continued)

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

(continued)

GC–2 affirming diversity

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
GC–2.5 valuing diversity	a. demonstrate a willingness to interact and work with others who are different; e.g., in culture, lifestyle, interests	a. engage in activities that reflect other cultural practices b. recognize advantages of entertaining different perspectives	a. seek out opportunities to interact with people of other cultures who have an interest in Spanish-speaking cultures b. recognize and acknowledge different perspectives
GC–2.6 intercultural skills	a. adapt to new situations b. listen with attention to the opinions of others c. initiate new relationships d. respect opinions of others, and recognize stereotypical thinking e. reflect on own actions and the impact of these actions on others	a. explore how their perspective is shaped by a variety of factors	a. explore representations of their own culture as seen from the outside b. identify and make use of media that facilitates contact with other countries and cultures c. explore various strategies for enhancing relations with people from different cultures

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

GC–3 personal and career opportunities

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
GC–3.1 Spanish and Spanish-speaking cultures	a. identify purposes for learning Spanish	a. explore personal reasons for learning Spanish; e.g., travel, friends, family b. explore opportunities for further education and/or careers related to Spanish	a. identify aspects of the history, literature, arts and crafts of the Spanish-speaking world that are of personal interest b. identify some careers where knowledge of the Spanish language and Spanish cultures would be valuable
GC–3.2 cultural and linguistic diversity	a. identify purposes for learning additional languages and learning about world cultures b. suggest some reasons for participating in activities and experiences that reflect elements of different cultures	a. explore personal reasons for learning additional languages and experiencing other cultures b. explore opportunities for further education or careers related to languages and culture c. identify some countries where there is significant linguistic and cultural diversity	a. identify aspects of the history, literature, arts and crafts of different cultures that are of personal interest b. identify some careers where knowledge of international languages and cultures would be valuable

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Strategies

language learning

language use

Students will know and use various strategies to maximize the effectiveness of learning and communication.

general learning

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STRATEGIES

Under the Strategies heading are specific outcomes that will help students learn and communicate more **effectively**. Strategic competence has long been recognized as an important component of communicative competence. The learning outcomes that follow deal not only with compensation and repair strategies, important in the early stages of language learning when proficiency is low, but with strategies for language learning, language use in a broader sense, as well as general learning strategies that help students acquire content. Although people may use strategies unconsciously, the learning outcomes deal only with the **conscious use** of strategies.

The strategies are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands that show the development of awareness and skill in using strategies from course to course. Each strand, identified by a strand heading at the left end of the row, deals with a specific category of strategy. Language learning and general learning strategies are categorized as cognitive, metacognitive and social/affective. The language use strategies are organized by communicative mode: interactive, interpretive, productive.

The strategies that students choose depend on the task they are engaged in as well as on other factors, such as their preferred learning style, personality, age, attitude and cultural background. Strategies that work well for one person may not be effective for another person, or may not be suitable in a different situation. For this reason it is not particularly useful to say that students should be aware of, or able to use, a specific strategy in a particular course. Consequently, the specific outcomes describe the students' knowledge of, and ability to use, general types of strategies. More specific strategies for each general category or type are included in the sample list of strategies below. The specific strategies provided in the sample list **are not prescriptive** but are provided as an illustration of how the general strategies in the specific outcomes might be developed.

Teachers need to know and be able to demonstrate a broad range of strategies from which students are then able to choose in order to communicate effectively. Strategies of all kinds are best taught in the context of learning activities where students can apply them immediately and then reflect on their use.

SAMPLE LIST OF STRATEGIES

Language Learning Strategies

Cognitive

- listen attentively
- perform actions to match words of a song, story or rhyme
- learn short rhymes or songs, incorporating new vocabulary or sentence patterns
- imitate sounds and intonation patterns
- memorize new words by repeating them silently or aloud
- seek the precise term to express meaning
- repeat words or phrases in the course of performing a language task
- make personal dictionaries
- experiment with various elements of the language
- use mental images to remember new information
- group together sets of things—vocabulary, structures—with similar characteristics
- identify similarities and differences between aspects of the Spanish language and own language
- look for patterns and relationships
- use previously acquired knowledge to facilitate a learning task
- associate new words or expressions with familiar ones, either in Spanish or in own language
- find information, using reference materials like dictionaries, textbooks and grammars
- use available technological aids to support language learning; e.g., cassette recorders, computers
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember

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- place new words or expressions in a context to make them easier to remember
- use induction to generate rules governing language use
- seek opportunities outside of class to practise and observe
- perceive and note down unknown words and expressions, noting also their context and function
- be aware of cognates whose meanings vary in different languages

Metacognitive
- check copied writing for accuracy
- make choices about how you learn
- rehearse or role-play language
- decide in advance to attend to the learning task
- reflect on learning tasks with the guidance of the teacher
- make a plan in advance about how to approach a language learning task
- reflect on the listening, reading and writing process
- decide in advance to attend to specific aspects of input
- listen or read for key words
- evaluate own performance or comprehension at the end of a task
- keep a learning log
- experience various methods of language acquisition, and identify one or more considered to be particularly useful personally
- be aware of the potential of learning through direct exposure to the language
- know how strategies may enable coping with texts containing unknown elements
- identify problems that might hinder successful completion of a task, and seek solutions
- monitor own speech and writing to check for persistent errors
- be aware of own strengths and weaknesses, identify own needs and goals, and organize strategies and procedures accordingly

Social/Affective
- initiate or maintain interaction with others
- participate in shared reading experiences
- seek the assistance of a friend to interpret a text
- reread familiar self-chosen texts to enhance understanding and enjoyment
- work cooperatively with peers in small groups
- understand that making mistakes is a natural part of language learning
- experiment with various forms of expression, and note their acceptance or nonacceptance by more experienced speakers
- participate actively in brainstorming and conferencing as prewriting and postwriting exercises
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- repeat new words and expressions occurring in own conversations, and make use of the new words as soon as appropriate
- reduce anxiety by using mental techniques, such as positive self-talk or humour
- work with others to solve problems, and get feedback on tasks
- provide personal motivation by arranging own rewards when successful

Language Use Strategies

Interactive
- use words from own first language to get meaning across; e.g., use a literal translation of a phrase in the first language, use a first language word but pronounce it as in the second language
- acknowledge being spoken to
- interpret and use a variety of nonverbal cues to communicate; e.g., mime, pointing, gestures, drawing pictures
- indicate lack of understanding verbally or nonverbally; e.g., *¿Cómo? Disculpe, No entiendo, No comprendo*
- ask for clarification or repetition when something is not understood; e.g., *¿Qué quiere decir ...?, ¿Puede repetir, por favor?*
- use the other speaker's words in subsequent conversation
- assess feedback from a conversation partner to recognize if a message has been understood; e.g., puzzled look

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- start again, using a different tactic, when communication breaks down; e.g., *Quiero decir que ...*
- use a simple word similar to the concept to convey, and invite correction; e.g., *fruta* for *naranja*
- invite others into the discussion; e.g., *¿no?, ¿verdad?*
- ask for guidance when new vocabulary and expressions are needed; e.g., *¿Cómo se dice ... en español?*
- ask for confirmation that a form used is correct; e.g., *¿Se puede decir ...?*
- use a range of fillers, hesitation devices and gambits to sustain conversations; e.g., *Pues ..., a ver ..., bueno ..., ¿qué más ...?*
- use circumlocution to compensate for lack of vocabulary; e.g., *la máquina que se usa para lavar la ropa* for *lavadora*
- repeat part of what someone has said to confirm mutual understanding; e.g., *Quieres decir que ..., Es decir que ...*
- summarize the point reached in a discussion to help focus the talk; e.g., *Es decir ..., o sea ...*
- ask follow-up questions to check for understanding; e.g., *¿Me entiende?, ¿Me sigue?, ¿Está claro?*
- use suitable phrases to intervene in a discussion; e.g., *Por cierto, hablando de ...*
- self-correct if errors lead to misunderstandings; e.g., *Mejor dicho, lo que quiero decir es ...*

Interpretive

- use gestures, intonation and visual supports to aid comprehension
- make connections between texts on the one hand and prior knowledge and personal experience on the other
- use illustrations to aid reading comprehension
- determine the purpose of listening
- listen or look for key words
- listen selectively based on purpose
- make predictions about what is expected to be heard or read, based on prior knowledge and personal experience
- use knowledge of the sound–symbol system to aid reading comprehension
- infer probable meanings of unknown words or expressions from contextual clues
- prepare questions or a guide to note down information found in a text
- use key content words or discourse markers to follow an extended text
- reread several times to understand complex ideas
- summarize information gathered
- assess own information needs before listening, viewing or reading
- use skimming and scanning to locate key information in texts

Productive

- mimic what the teacher says
- use nonverbal means to communicate
- copy what others say or write
- use words visible in the immediate environment
- use resources to increase vocabulary
- use familiar repetitive patterns from stories, songs, rhymes or media
- use illustrations to provide detail when producing own texts
- use various techniques to explore ideas at the planning stage, such as brainstorming or keeping a notebook or log of ideas
- use knowledge of sentence patterns to form new sentences
- be aware of and use the steps of the writing process: prewriting (gathering ideas, planning the text, researching, organizing the text), writing, revision (rereading, moving pieces of text, rewriting pieces of text), correction (grammar, spelling, punctuation), publication (reprinting, adding illustrations, binding)
- use a variety of resources to correct texts; e.g., personal and commercial dictionaries, checklists, grammars
- take notes when reading or listening to assist in producing own text
- revise and correct final version of text
- use circumlocution and definition to compensate for gaps in vocabulary
- apply grammar rules to improve accuracy at the correction stage
- compensate for avoiding difficult structures by rephrasing

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General Learning Strategies

Cognitive

- classify objects and ideas according to their attributes; e.g., animals that eat meat and animals that eat plants
- use models
- connect what is already known with what is being learned
- experiment with and concentrate on one thing at a time
- focus on and complete learning tasks
- record key words and concepts in abbreviated form—verbal, graphic or numerical—to assist with performance of a learning task
- use mental images to remember new information
- distinguish between fact and opinion when using a variety of sources of information
- formulate key questions to guide research
- make inferences, and identify and justify the evidence on which these inferences are based
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember
- seek information through a network of sources, including libraries, the Internet, individuals and agencies
- use previously acquired knowledge or skills to assist with a new learning task

Metacognitive

- reflect on learning tasks with the guidance of the teacher
- reflect upon own thinking processes and how you learn
- choose from among learning options
- discover how own efforts can affect learning
- decide in advance to attend to the learning task
- divide an overall learning task into a number of subtasks
- make a plan in advance about how to approach a task
- identify own needs and interests
- manage own physical working environment
- keep a learning journal, such as a diary or a log
- develop criteria for evaluating own work
- work with others to monitor own learning
- take responsibility for planning, monitoring and evaluating learning experiences

Social/Affective

- watch others' actions and copy them
- seek help from others
- follow own natural curiosity and intrinsic motivation to learn
- participate in cooperative group learning tasks
- choose learning activities that enhance understanding and enjoyment
- be encouraged to try, even though mistakes might be made
- take part in group decision-making processes
- use support strategies to help peers persevere at learning tasks; e.g., offer encouragement, praise, ideas
- take part in group problem-solving processes
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- monitor own level of anxiety about learning tasks, and take measures to lower it if necessary; e.g., deep breathing, laughter
- use social interaction skills to enhance group learning activities

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
S–1.1 cognitive	a. use simple cognitive strategies, with guidance, to enhance language learning; e.g., memorize new words by writing and repeating them silently or aloud	a. identify and use a variety of cognitive strategies to enhance language learning; e.g., group together sets of things (vocabulary, structures) with similar characteristics, identify similarities and differences between aspects of the language being learned and their own language	a. select and use a variety of cognitive strategies to enhance language learning; e.g., associate new words or expressions with familiar ones, either in the language being learned or in their own language
S–1.2 metacognitive	a. use simple metacognitive strategies, with guidance, to enhance language learning; e.g., rehearse or role-play language	a. identify and use a variety of metacognitive strategies to enhance language learning; e.g., reflect on the listening, reading and writing process, listen or read for key words	a. select and use a variety of metacognitive strategies to enhance language learning; e.g., evaluate their own performance or comprehension at the end of a task, keep a learning log
S–1.3 social/affective	a. use simple social and affective strategies, with guidance, to enhance language learning; e.g., seek the assistance of a friend to interpret a text, take risks and try unfamiliar tasks and approaches, understand that making mistakes is a natural part of language learning	a. identify and use a variety of social and affective strategies to enhance language learning; e.g., work with others to solve problems, get feedback on tasks	a. select and use a variety of social and affective strategies to enhance language learning; e.g., repeat new words or expressions occurring in conversations in which they participate, make use of the new words as soon as appropriate

Further examples of language learning strategies are available on pages 34 and 35.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–2 language use

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
S–2.1 interactive	a. use simple interactive strategies with guidance; e.g., indicate lack of understanding verbally or nonverbally	a. identify and use a variety of interactive strategies; e.g., start again using a different tactic when communication breaks down, use a simple word similar to the concept they want to convey and invite correction	a. select and use a variety of interactive strategies; e.g., use a range of fillers, hesitation devices and gambits to sustain conversations, use circumlocution to compensate for lack of vocabulary
S–2.2 interpretive	a. use simple interpretive strategies with guidance; e.g., use illustrations to aid reading comprehension, listen and read selectively, make predictions about what they expect to hear or read, use gestures, use key words	a. identify and use a variety of interpretive strategies; e.g., prepare questions or a guide to note down information found in the text	a. select and use a variety of interpretive strategies; e.g., infer the probable meaning of unknown words or expressions from contextual clues, reread several times to understand complex texts
S–2.3 productive	a. use simple productive strategies with guidance; e.g., mimic what the teacher says, use words that are visible in the immediate environment	a. identify and use a variety of productive strategies; e.g., use knowledge of sentence patterns to form new sentences	a. select and use a variety of productive strategies; e.g., use resources to increase vocabulary

Further examples of language use strategies are available on pages 35 and 36.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–3 general learning

	Spanish Language and Culture 10-3Y	Spanish Language and Culture 20-3Y	Spanish Language and Culture 30-3Y
	Students will be able to:		
S–3.1 cognitive	a. use simple cognitive strategies to enhance general learning; e.g., connect what they already know with what they are learning, classify objects according to attributes	a. identify and use a variety of cognitive strategies to enhance general learning; e.g., record key words and concepts in abbreviated form—verbal, graphic or numerical—to assist with performance of a learning task	a. select and use a variety of cognitive strategies to enhance general learning; e.g., make inferences, and identify and justify the evidence on which their inferences are based, distinguish between fact and opinion when using a variety of sources of information
S–3.2 metacognitive	a. use simple metacognitive strategies to enhance general learning; e.g., discover how their efforts can affect their learning, explore and identify different learning styles	a. identify and use a variety of metacognitive strategies to enhance general learning; e.g., make a plan in advance about how to approach a task, keep a learning journal such as a diary or log	a. select and use a variety of metacognitive strategies to enhance general learning; e.g., identify their own needs and interests
S–3.3 social/affective	a. use simple social and affective strategies to enhance general learning; e.g., seek help from others, participate in cooperative learning	a. identify and use a variety of social and affective strategies to enhance general learning; e.g., encourage themselves to try even though they might make mistakes, take part in group decision-making processes	a. select and use a variety of social and affective strategies to enhance general learning; e.g., use support strategies to help peers persevere at learning tasks, follow own natural curiosity and intrinsic motivation to learn

Further examples of general learning strategies are available on page 37.

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SPANISH LANGUAGE AND CULTURE 10-6Y, 20-6Y, 30-6Y

This program of studies is intended for students who began their study of Spanish language and culture in Grade 7. It constitutes the last three years of the Spanish Language and Culture Six-year (6Y) Program. The Spanish Language and Culture Six-year Program, Grades 7–8–9, constitutes the first three years of the six-year program.

INTRODUCTION

Over 350 million people in the world speak Spanish. It is the official language of the following countries: Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Equatorial Guinea, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Spain, Uruguay and Venezuela. It is also spoken in many other countries in which it is not the official language, including the United States of America and the Philippines. It is one of the most widely spoken languages in the world.

The value of learning the Spanish language is enormous for Alberta society as a whole. Apart from the common advantages related to the learning of an international language, it permits an insight into the rich and varied cultures developed in the Spanish-speaking world and bestows more opportunity to communicate directly with Spanish-speaking people. In addition, the important economic role the Spanish-speaking countries are playing in the international market and their increasing trading partnership with Alberta are undeniable.

The learning of Spanish, as any other language, develops awareness of, and sensitivity to, cultural and linguistic diversity. This fact, in addition to preserving cultural identity, is also a means of cultural enrichment and is the best means of fostering understanding and solidarity among peoples and countries. Furthermore, it gives the opportunity to identify, question and challenge one's own cultural assumptions, values and perspectives and contribute positively to society.

As well, for those students who already have some knowledge of the Spanish language or a family connection to the culture, learning Spanish offers an opportunity to renew contact with their language and culture. For some, it may contribute to maintaining and developing literacy in a first language that is not necessarily the majority language in the community.

There is also significant evidence to suggest that learning another language contributes to the development of increased grammatical abilities in the first language and enhances cognitive functioning. Learning a second language increases the ability to conceptualize and to think abstractly, and it fosters more cognitive flexibility, greater divergent thinking, creativity and metalinguistic competence.

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In today's global world, the knowledge of a second language and culture in general, and Spanish in particular, is an economic advantage for individuals, providing skills that enable them to communicate and interact effectively in the global marketplace and workplace.

ASSUMPTIONS

The following statements are assumptions that have guided the development process of this program of studies.

- Language is communication.
- All students can be successful learners of language and culture, although they will learn in a variety of ways and acquire proficiency at varied rates.
- All languages can be taught and learned.
- Learning Spanish as a second language leads to enhanced learning in both the student's primary language and in related areas of cognitive development and knowledge acquisition. This is true of students who come to the class with some background knowledge of Spanish and develop literacy skills in the language. It is also true for students who have no cultural or linguistic background in Spanish and are studying Spanish as a second language.

THE CONCEPTUAL MODEL

The aim of this program of studies is the development of communicative competence in Spanish.

Four Components

For the purposes of this program of studies, communicative competence is represented by four interrelated and interdependent components.

Applications deal with what the students will be able to do with the language, the functions they will be able to perform and the contexts in which they will be able to operate.

Language Competence addresses the students' knowledge of the language and their ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used.

Global Citizenship aims to develop intercultural competence, with a particular focus on cultures of the Spanish-speaking world.

Strategies help students learn and communicate more effectively and more efficiently.

Each of these components is described more fully at the beginning of the corresponding section of this program of studies.

Modes of Communication

Because of the focus on using language to communicate in specific contexts, with a particular purpose or task in mind, three modes of communication are used to organize some of the specific outcomes.

Interaction is most often direct, face-to-face oral communication, but it can take the form of written communication between individuals, using a medium such as e-mail where the exchange of information is fairly immediate. It is characterized principally by the opportunity to actively negotiate meaning; that is, helping others understand and working to understand others. Interactive communication generally requires more speed but less accuracy than the other two modes.

Interpretation is receptive communication of oral and written messages in contexts where the listener or reader is not in direct contact with the creator of the message. While there is no opportunity to ask for clarification, there is sometimes the possibility of rereading or listening again, consulting references, or making the meaning clearer in other ways. Reading and listening will sometimes involve **viewing** and interpreting visual elements, such as illustrations in books or moving images in television and film. Interpretation goes beyond a literal comprehension to include an understanding of some of the unspoken or unwritten meaning intended by the speaker or author.

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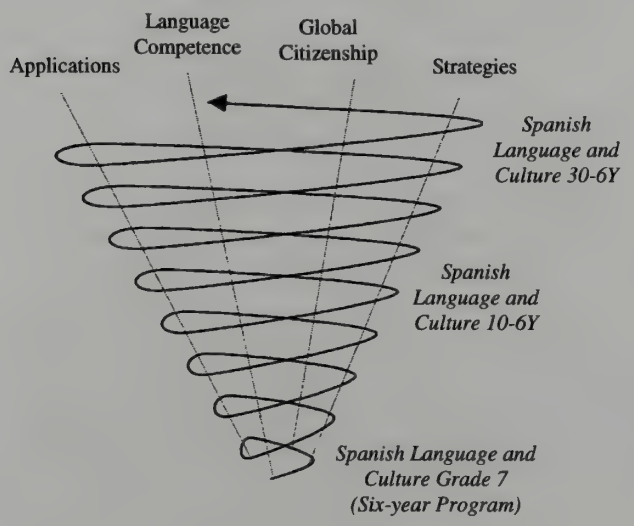
Production is communication of oral and written messages in contexts where the audience is not in personal contact with the speaker or writer, or in situations of one-to-many communication; e.g., a lecture or a performance where there is no opportunity for the listener to interact with the speaker. Oral and written presentations will sometimes be enhanced by **representing** the meaning visually, using pictures, diagrams, models, drama techniques or other nonverbal forms of communication. Greater knowledge of the language and culture is required to ensure that communication is successful, since the participants cannot directly negotiate meaning.

A Spiral Progression

Language learning is integrative, not merely cumulative. Each new element that is added must be integrated into the whole of what has gone before. The model that best represents the students' language learning progress is an expanding spiral. Their progression is not only vertical (e.g., increased proficiency) but also horizontal (e.g., broader range of applications and experience with more text forms, contexts and so on). The spiral also represents how language learning activities are best structured. Particular lexical fields, learning strategies or language functions, for example, are revisited at different points in the program, but from a different perspective, in broader contexts or at a slightly higher level of proficiency each time. Learning is reinforced, extended and broadened with each successive pass.



ORGANIZATION OF THE PROGRAM OF STUDIES

General Outcomes

General outcomes are broad statements identifying the knowledge, skills and attitudes that students are expected to achieve in the course of their language learning experience. The four general outcomes serve as the foundation for this program of studies and are based on the conceptual model outlined above.

Applications [A]
- Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

Language Competence [LC]
- Students will use Spanish **effectively** and **competently**.

Global Citizenship [GC]
- Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

Strategies [S]
- Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

The order in which the general outcomes are presented in the program of studies does not represent a sequential order, nor does it indicate the relative importance of each component. The general outcomes are to be implemented in an integrated manner.

Specific Outcomes

Each general outcome is further broken down into specific outcomes that students are to achieve by the end of each course. The specific outcomes are interrelated and interdependent. In most classroom activities, a number of learning outcomes will be dealt with in an integrated manner.

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The specific outcomes are categorized under cluster headings, which show the scope of each of the four general outcomes. These headings are shown in the table on the following page.

The specific outcomes are further categorized by strands, which show the developmental flow of learning from the beginning to the end of the program. However, an outcome for a particular course will not be dealt with only in that particular year of the program. The spiral progression that is part of the conceptual model means that activities in the years preceding will prepare the ground for acquisition and in the years following will broaden applications.

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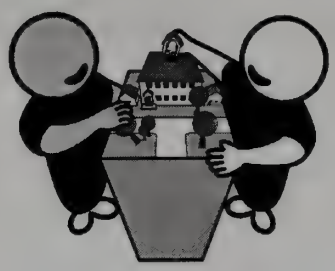
General Outcomes

Applications



Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information
A–2 to express emotions and personal perspectives
A–3 to get things done
A–4 to form, maintain and change interpersonal relationships
A–5 to extend their knowledge of the world
A–6 for imaginative purposes and personal enjoyment

Language Competence

Students will use Spanish **effectively** and **competently**.

LC–1 attend to form
LC–2 interpret and produce texts
LC–3 apply knowledge of the sociocultural context
LC–4 apply knowledge of how text is organized, structured and sequenced in Spanish

Global Citizenship

Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

GC–1 historical and contemporary elements of Spanish-speaking cultures
GC–2 affirming diversity
GC–3 personal and career opportunities

Strategies

Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning
S–2 language use
S–3 general learning

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General Outcome for Applications
Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

cluster heading for specific outcomes

A–6 for imaginative purposes and personal enjoyment

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
A–6.1 humour/fun	a. participate in class excursions, field trips or twinning projects b. interpret songs and stories	a. use the language for fun and to interpret and express humour; e.g., learn and perform songs, dances, short plays	a. use language for fun and to interpret and express humour; e.g., humorous or editorial cartoons, stories, poems
A–6.2 creative/aesthetic purposes	a. use the language creatively and for aesthetic purposes; e.g., experiment with the sounds and rhythms of the language	a. use the language creatively and for aesthetic purposes; e.g., create a multimedia presentation on a familiar topic	a. use the language creatively and for aesthetic purposes; e.g., write new words to a known melody or create a rap
A–6.3 personal enjoyment	a. use the language for personal enjoyment; e.g., find a personal pen pal and exchange letters	a. use the language for personal enjoyment; e.g., use the Internet to explore the culture being studied	a. use the language for personal enjoyment; e.g., keep a personal journal

read each page vertically for outcomes expected at the end of each course

strand headings for specific outcomes

specific outcome statements for each course

read each page horizontally for developmental flow of outcomes from course to course

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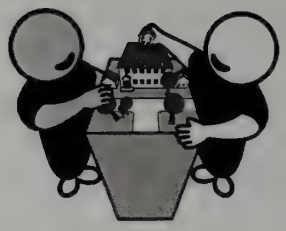

Applications

to express emotions and personal perspectives

to receive and impart information

to get things done

Students will use Spanish in a variety of situations and for a variety of purposes.

to form, maintain and change interpersonal relationships

for imaginative purposes and personal enjoyment

to extend their knowledge of the world

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APPLICATIONS

The specific outcomes under the heading Applications deal with **what** the students will be able to do with the Spanish language; that is, the **functions** they will be able to perform and the **contexts** in which they will be able to operate.

The functions are grouped under six cluster headings—see the illustration on the preceding page. Under each of these headings there are one or more strands, which show the developmental flow of learning from course to course. Each strand, identified by a strand heading at the left end of a row, deals with a specific language function; e.g., share factual information. Students at any grade level will be able to share factual information. Beginning learners will do this in very simple ways. As students gain more knowledge and experience, they will broaden the range of subjects they can deal with, they will learn to share information in writing as well as orally, and they will be able to handle formal and informal situations.

Different models of communicative competence have organized language functions in a variety of ways. The organizational structure chosen here reflects the needs and interests of students in a classroom where activities are focused on meaning and are interactive. For example, the strand entitled "manage group actions" has been included to ensure that students acquire the language necessary to function independently in small groups, since this is an effective way of organizing second language classrooms. The strands under the cluster heading "to extend their knowledge of the world" will accommodate a content-based approach to language learning where students learn content from another subject area as they learn the Spanish language.

The level of linguistic, sociolinguistic and discourse competence that students will exhibit when carrying out the functions is defined in the specific outcomes for Language Competence for each course. To know how well students will be able to perform the specific function, the Applications outcomes must be read in conjunction with the Language Competence outcomes.

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General Outcome for Applications
Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

A–1 to receive and impart information

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
A–1.1 share factual information	a. provide information on several aspects of a topic; e.g., give a simple report b. understand and use definitions, comparisons and examples	a. share facts about events that took place in the past or that may take place in the future	a. share detailed information on a specific topic; e.g., a report or biography

A–2 to express emotions and personal perspectives

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
A–2.1 share ideas, thoughts, opinions, preferences	a. inquire about and express agreement and disagreement, approval and disapproval, satisfaction and dissatisfaction, interest and lack of interest	a. inquire about and express probability and certainty	a. express opinions b. support their own opinions
A–2.2 share emotions, feelings	a. inquire about and express emotions and feelings in a variety of familiar contexts b. compare the expression of emotions and feelings in a variety of informal situations	a. express emotions and feelings in formal situations; e.g., make a complaint in a store or restaurant	a. compare the expression of emotions and feelings in formal and informal situations

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General Outcome for Applications
Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

A–3 to get things done

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
A–3.1 guide actions of others	a. make and respond to suggestions in a variety of situations b. give and respond to advice and warnings	a. make and respond to suggestions or requests in formal situations; e.g., in a public library, post office or travel agency	a. lodge a complaint b. persuade others to take a course of action
A–3.2 state personal actions	a. state personal actions in the past, present or future b. make a promise, and express intention in a variety of situations	a. accept or decline an offer or invitation, with explanations	a. express possibility in relation to their own actions and plans
A–3.3 manage group actions	a. check for agreement and understanding b. express disagreement in an appropriate way c. express appreciation, enthusiasm, support and respect for contributions of others	a. paraphrase, elaborate on and clarify another member's contribution	a. take on a leadership role in small-group projects

A–4 to form, maintain and change interpersonal relationships

	Students will be able to:		
A–4.1 manage personal relationships	a. initiate and participate in casual exchanges with classmates b. use routine means of interpersonal communications; e.g., telephone calls, personal notes, e-mail messages	a. give and respond to compliments, and explain actions	a. offer and respond to congratulations, and express sympathy or regret

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General Outcome for Applications
Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

A–5 to extend their knowledge of the world

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
A–5.1 discover and explore	a. ask questions to gain knowledge and clarify understanding b. explore meaning in a variety of ways; e.g., by drawing a diagram, making a model, rephrasing	a. explore and express the meaning of what they are doing; e.g., what they will learn from a particular activity	a. explore connections among and gain new insights into familiar topics; e.g., using analogy, brainstorming
A–5.2 gather and organize information	a. gather information from a variety of resources; e.g., print, human, multimedia b. organize and manipulate information; e.g., transform information from texts into other forms, such as tables, diagrams, story maps	a. gather information, using a prepared format; e.g., interview people, using prepared questions	a. identify key ideas, summarize and paraphrase
A–5.3 explore opinions and values	a. explore how values influence behaviour; e.g., describe characters and their motivations in a story b. provide reasons for their position on an issue	a. distinguish fact from opinion	a. understand the concept of stereotype, and recognize stereotyping in a variety of situations
A–5.4 solve problems	a. describe and analyze a problem, then propose solutions b. generate and evaluate alternative solutions to problems	a. use information collected from various sources to solve problems	a. apply problem-solving skills to the resolution of real-life problems

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General Outcome for Applications
Students will use Spanish in a variety of **situations** and for a variety of **purposes**.

A–6 for imaginative purposes and personal enjoyment

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
A–6.1 humour/fun	a. participate in class excursions, field trips or twinning projects b. interpret songs and stories	a. use the language for fun and to interpret and express humour; e.g., learn and perform songs, dances, short plays	a. use language for fun and to interpret and express humour; e.g., humorous or editorial cartoons, stories, poems
A–6.2 creative/aesthetic purposes	a. use the language creatively and for aesthetic purposes; e.g., experiment with the sounds and rhythms of the language	a. use the language creatively and for aesthetic purposes; e.g., create a multimedia presentation on a familiar topic	a. use the language creatively and for aesthetic purposes; e.g., write new words to a known melody or create a rap
A–6.3 personal enjoyment	a. use the language for personal enjoyment; e.g., find a personal pen pal and exchange letters	a. use the language for personal enjoyment; e.g., use the Internet to explore the culture being studied	a. use the language for personal enjoyment; e.g., keep a personal journal

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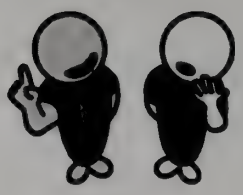
Language Competence



interpret and produce texts

attend to form

Students will use Spanish effectively and competently.

apply knowledge of the sociocultural context

apply knowledge of how text is organized, structured and sequenced in Spanish

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LANGUAGE COMPETENCE

Language competence is a broad term that includes linguistic or grammatical competence, discourse competence, sociolinguistic or sociocultural competence, and what might be called textual competence. The specific outcomes under Language Competence deal with knowledge of the Spanish language and the ability to use that knowledge to interpret and produce meaningful texts appropriate to the situations in which they are used. Language competence is best developed in the context of activities or tasks where the language is used for real purposes; in other words, in practical **applications**.

The various components of language competence are grouped under four cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of language competence. For example, under the cluster heading "attend to form," there is a strand for phonology (pronunciation, stress, intonation), orthography (spelling, mechanical features), lexicon (vocabulary words and phrases) and grammatical elements (syntax and morphology).

Although the outcomes isolate these individual aspects, language competence should be developed through learning activities that focus on meaningful uses of the Spanish language and on **language in context**. Tasks will be chosen based on the needs, interests and experiences of students. The vocabulary, grammar structures, text forms and social conventions necessary to carry out a task will be taught, practised and assessed as students are involved in various aspects of the task itself, **not in isolation**.

Strategic competence is often closely associated with language competence, since students need to learn ways to compensate for low proficiency in the early stages of learning if they are to engage in authentic language use from the beginning. This component is included in the language use strategies in the Strategies section.

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

LC–1 attend to form

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
LC–1.1 phonology	a. identify and reproduce some critical sound distinctions that are important for meaning	a. use intonation, stress and rhythm appropriately in familiar situations	a. speak clearly and intelligibly in a variety of situations
LC–1.2 orthography	a. apply some common spelling rules b. use basic spelling patterns consistently in writing familiar words and phrases	a. use basic mechanical conventions; e.g., capitalization, punctuation b. use basic spelling patterns in writing unfamiliar words and phrases	a. recognize and correctly spell familiar words; e.g., sight words b. apply basic spelling rules consistently, and use mechanical conventions with reasonable accuracy
LC–1.3 lexicon	a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including: • arts and entertainment—music • relationships—friends, clubs, activities, sports, hobbies • celebrations—cultural • fashions and fads • driving • folk tales/fables • daily routines • any other lexical fields that meet their needs and interests	a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including: • fine arts • legends and myths • communications, technology and media – power and impact of media and advertising • travel • world/current events – differences in media coverage of events in different nations • any other lexical fields that meet their needs and interests	a. use a repertoire of words and phrases in familiar contexts, within a variety of lexical fields, including: • literature – poetry – contemporary Spanish writers • future plans • careers • studying/living abroad – accommodations—looking for an apartment • history • current issues • globalization/globalism • any other lexical fields that meet their needs and interests
	b. recognize that one word may have multiple meanings, depending on the context, and that various words and expressions may express the same idea	b. use a small range of vocabulary to convey shades of meaning	b. select vocabulary and expressions from within their repertoire to fulfill a variety of purposes in a variety of contexts

(continued)

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

(continued)

LC–1 attend to form

LC–1.4 grammatical elements

Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
Students will be able to:		
a. use, in modelled situations,[1] the following grammatical elements:		
• possessive pronouns: *mío, tuyo, suyo, míos, tuyos, suyos* • indirect object pronouns • double object pronouns • impersonal verb form with *se* • preterite (irregular verbs) • preterite vs. imperfect • comparative, superlative and diminutive	• future tense • conditional mood • subjunctive mood • present subjunctive: – to express wishes and hope: *Ojalá que ..., Quiero que ...* – to express emotion: *alegrarse, sentir ...* – to persuade: *aconsejar, decir, desear, pedir* – after impersonal expressions: *es una lástima que ..., es necesario que ...* – after *cuando* and *aunque* – to express doubt • gerund with imperfect of *estar* • impersonal verb form with *se*	• pluperfect tense • passive voice • indicative or subjunctive with relative pronouns; e.g.: – *Conozco a alguien que habla español.* – *Busca a alguien que hable español.* • imperfect subjunctive + conditional (*si* clauses)

(continued)

1. Modelled Situations: This term is used to describe learning situations where a model of specific linguistic elements is consistently provided and immediately available. Students in such situations will have an emerging awareness of the linguistic elements and will be able to apply them in very limited situations. Limited fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

(continued)

LC–1 attend to form

LC–1.4
grammatical elements

Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
Students will be able to:		
b. use, in structured situations,[2] the following grammatical elements:		
• commands—negative forms • commands—irregular verbs (*tú* form) • stem changing verbs in the present tense • irregular verbs: *dar, poner, traer* • preterite (regular verbs) • perfect tense • direct object pronouns • reflexive verbs	• possessive pronouns: *mío, tuyo, suyo, míos, tuyos, suyos* • indirect object pronouns • double object pronouns • preterite (irregular verbs) • imperfect tense • preterite vs. imperfect • comparative, superlative and diminutive	• future tense • conditional mood • subjunctive mood • present subjunctive: – to express wishes and hope: *Ojalá que ..., Quiero que ...* – to express emotion: *alegrarse, sentir ...* – to persuade: *aconsejar, decir, desear, pedir* – after impersonal expressions: *es una lástima que ..., es necesario que ...* – to express doubt – after *cuando* and *aunque* • impersonal verb form with *se*

(continued)

2. Structured Situations: This term is used to describe learning situations where a familiar context for the use of specific linguistic elements is provided and students are guided in the use of these linguistic elements. Students in such situations will have increased awareness and emerging control of the linguistic elements and will be able to apply them in familiar contexts with teacher guidance. Student language is characterized by increasing fluency and confidence.

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

(continued)

LC–1 attend to form

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
LC–1.4 grammatical elements	c. use, independently and consistently,[3] the following grammatical elements:		
	• *nos/les (os) gusta/an* • possessive adjectives and pronouns: *nuestro/a/os/as, vuestro/a/os/as* • irregular verbs: *poder, conocer, saber, venir, salir, decir, hacer, preferir* • commands—regular verbs (*tú* form) • commands for commonly used verbs (*usted, ustedes*) • present progressive (*estar* + gerund)	• commands—negative forms • commands—irregular verbs (*tú* form) • stem changing verbs in the present tense • irregular verbs: *dar, poner, traer* • preterite (regular verbs) • perfect tense • direct object pronouns • reflexive verbs	• possessive pronouns: *mío, tuyo, suyo, míos, tuyos, suyos* • indirect object pronouns • double object pronouns • preterite (irregular verbs) • imperfect tense • preterite vs. imperfect • comparative, superlative and diminutive

3. Independently and Consistently: This term is used to describe learning situations where students use specific linguistic elements in a variety of contexts with limited teacher guidance. Students in such situations will have consistent control of the linguistic elements and will be able to apply them in a variety of contexts with limited teacher guidance. Fluency and confidence characterize student language.

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

LC–2 interpret and produce texts

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
LC–2.1 aural interpretation	a. understand short oral texts on unfamiliar topics in guided situations	a. understand a variety of short oral texts on unfamiliar topics in guided situations	a. understand the main point and some supporting details of lengthy oral texts on familiar topics in guided situations
LC–2.2 written interpretation	a. understand short written texts on unfamiliar topics in guided situations	a. understand a variety of short written texts on unfamiliar topics in guided situations	a. understand the main point and some supporting details of lengthy written texts on familiar topics in guided situations
LC–2.3 interactive fluency	a. manage short interactions with ease, with pauses for planning and repair	a. manage simple, routine interactions without undue difficulty, asking for repetition or clarification when necessary	a. manage simple, routine interactions without undue difficulty
LC–2.4 visual interpretation	a. derive meaning from multiple visual elements in a variety of media in guided situations	a. derive meaning from multiple visual elements in a variety of media in guided and unguided situations	a. propose several interpretations of the visual elements of a variety of media in guided situations
LC–2.5 oral production	a. produce short oral texts in guided and unguided situations	a. produce a variety of short, simple oral texts in guided and unguided situations	a. produce short oral texts on unfamiliar topics in guided situations
LC–2.6 written production	a. produce short, simple written texts in guided and unguided situations	a. produce a variety of short, simple written texts in guided and unguided situations	a. produce short written texts on unfamiliar topics in guided situations
LC–2.7 representation	a. express meaning through the use of multiple visual elements in a variety of media in guided situations	a. express meaning through the use of multiple visual elements in a variety of media in guided and unguided situations	a. explore a variety of ways that meaning can be expressed through the visual elements of a variety of media in guided situations

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

LC–3 apply knowledge of the sociocultural context

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
LC–3.1 register	a. identify socially appropriate language in specific situations b. explore formal and informal uses of language in a variety of contexts	a. use suitable, simple formal language in a variety of contexts	a. explore differences in register between spoken and written texts
LC–3.2 idiomatic expressions	a. use learned idiomatic expressions in a variety of contexts	a. examine the role of idiomatic expressions in culture	a. identify influences on idiomatic expressions; e.g., region, age, occupation
LC–3.3 variations in language	a. recognize influences resulting in variations in language; e.g., age, social class, geographical region	a. experiment with some variations in language	a. experiment with and adapt to some variations in language
LC–3.4 social conventions	a. explore and identify variations in social conventions; e.g., regional, situational	a. interpret and use a variety of formal and informal social conventions, with guidance	a. use politeness conventions in a variety of contexts
LC–3.5 nonverbal communication	a. interpret and use appropriate nonverbal behaviours in a variety of familiar contexts	a. interpret and use a variety of nonverbal behaviours, with guidance	a. interpret and use a variety of nonverbal behaviours in a variety of contexts

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General Outcome for Language Competence
Students will use Spanish **effectively** and **competently**.

LC–4 apply knowledge of how text is organized, structured and sequenced in Spanish

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
LC–4.1 cohesion/coherence	a. organize texts, using common patterns; e.g., cause and effect, straightforward time sequencing, steps in a procedure b. interpret simple references within texts; e.g., pronouns, demonstratives	a. use a variety of conventions to structure texts; e.g., titles, paragraphs, letter forms b. interpret and use references within texts; e.g., pronouns, demonstratives	a. use appropriate words or phrases to show relationships in texts; e.g., *portanto, por lo tanto, además, pero, de una manera*
LC–4.2 text forms	a. recognize and use a variety of text forms delivered through a variety of media; e.g., videotaped instructions, reports with visuals b. analyze and identify the organizational structure of a variety of text forms; e.g., folk tales/fables, newspaper articles, instructions for a game	a. use a variety of familiar text forms and media in their own productions; e.g., recipes, comic strips, letters, radio or television reports, articles, tickets, timetables, itineraries	a. use a variety of familiar text forms and media in their own productions; e.g., poetry, stories, media articles, Web sites, reports
LC–4.3 patterns of social interaction	a. initiate interactions, and respond using a variety of social interaction patterns; e.g., routine telephone calls	a. combine simple social interaction patterns to perform transactions and interactions; e.g., invitation—acceptance/ refusal with explanation	a. combine simple social interaction patterns to perform complex transactions and interactions; e.g., request goods/services

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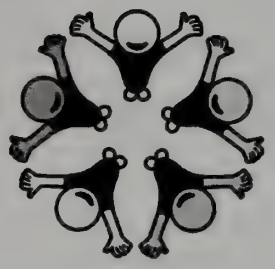
Global Citizenship



historical and contemporary elements of Spanish-speaking cultures

affirming diversity

Students will acquire the knowledge, skills and attitudes to be effective global citizens, through the exploration of the cultures of the Spanish-speaking world.

personal and career opportunities

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GLOBAL CITIZENSHIP

The learning outcomes for Global Citizenship deal with the development of intercultural competence, encompassing some of the knowledge, skills and attitudes that students need in order to be effective global citizens. The concept of global citizenship encompasses citizenship at all levels, from the local school and community to Canada and the world.

The various components of global citizenship are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands, identified by strand headings at the left end of each row, which show the developmental flow of learning from course to course. Each strand deals with a single aspect of intercultural competence. For example, under the cluster heading "historical and contemporary elements of Spanish-speaking cultures," there are strands for the processes and methods of acquiring knowledge about Spanish-speaking cultures, the cultural knowledge thus acquired, applications of that knowledge to aid comprehension and to communicate in appropriate ways, positive attitudes toward Spanish-speaking cultures, as well as knowledge of the diversity within those cultures.

Developing cultural knowledge and skills is a lifelong process. Knowledge of one's own culture is acquired over a lifetime. Cultures change over time. Within any national group, there may be a dominant culture or cultures and a number of minority cultures. Rather than developing an extensive bank of knowledge about the Spanish-speaking cultures, it is more important for students to learn the processes and methods of accessing and analyzing cultural practices. Students will gain cultural knowledge in the process of developing these skills. In this way, if they encounter elements of the Spanish-speaking cultures they have not learned about in class, they will have the skills and abilities to deal with them effectively and appropriately.

The "affirming diversity" heading covers knowledge, skills and attitudes that are developed as a result of bringing other languages and cultures into relationship with one's own. There is a natural tendency when learning a new language and culture to compare it with what is familiar. Many students leave a second language learning experience with a heightened awareness and knowledge of their own language and culture. They will also be able to make some generalizations about languages and cultures based on their experiences and those of their classmates, who may have a variety of cultural backgrounds. This will provide students with an understanding of diversity within both a global and a Canadian context.

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

GC–1 historical and contemporary elements of Spanish-speaking cultures

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
GC–1.1 knowledge of Spanish-speaking cultures	a. explore and identify some elements of Spanish-speaking cultures; e.g., key historical events and their influence on contemporary ways of life and cultural values	a. explore and identify some elements of Spanish-speaking cultures; e.g., cultural values, attitudes and interests of people their own age from Spanish-speaking cultures	a. explore and identify some elements of Spanish-speaking cultures; e.g., major current events as a reflection of contemporary ways of life and cultural values
GC–1.2 accessing/ analyzing cultural knowledge	a. formulate questions about elements of Spanish-speaking cultures; e.g., patterns of behaviour or interaction typical of people their own age b. use basic research skills to find out about Spanish-speaking cultures	a. make and test hypotheses about Spanish-speaking cultures b. identify and use a variety of sources of information to find out about Spanish-speaking cultures	a. organize and represent information about elements of Spanish-speaking cultures in a variety of ways
GC–1.3 applying cultural knowledge	a. apply knowledge of elements of Spanish-speaking cultures to interpret cultural behaviour that is different from their own b. apply knowledge of elements of Spanish-speaking cultures in interactions with people and texts; e.g., interpret historical references	a. identify different perspectives on Spanish-speaking cultures, and speculate on their origins; e.g., stereotypes of Spanish-speaking cultures present in own community	a. apply knowledge of elements of Spanish-speaking cultures, derived from a variety of sources, to interpret behaviours and texts
GC–1.4 diversity of Spanish-speaking cultures	a. apply knowledge of diverse elements of Spanish-speaking cultures in interactions with people and text; e.g., ethnic or religious minorities	a. identify different perspectives on diverse elements of Spanish-speaking cultures, and speculate on their origins; e.g., stereotypes within Spanish-speaking cultures	a. apply knowledge of diverse elements of Spanish-speaking cultures, derived from a variety of sources, to interpret behaviours and texts

(continued)

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

(continued)

GC–1 historical and contemporary elements of Spanish-speaking cultures

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
GC–1.5 valuing Spanish-speaking cultures	a. express empathy for those whose cultural behaviour is different from their own b. choose to participate in and contribute to activities and experiences that reflect Spanish-speaking cultures	a. examine their own perception of the Spanish language and cultures, including stereotypes	a. seek out and use opportunities to communicate with members of Spanish-speaking cultures; e.g., exchange letters with a pen pal

GC–2 affirming diversity

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
GC–2.1 awareness of first language	a. identify some regional variations in their first language	a. identify aspects of their personal style in both speech and writing	a. analyze the ways in which their first language and Spanish are similar and ways in which they are different
GC–2.2 general language knowledge	a. recognize that languages may have regional differences in pronunciation, vocabulary or structure	a. describe ways that languages evolve over time, and give reasons for their evolution	a. describe factors that influence the status of languages
GC–2.3 awareness of Canadian culture	a. identify some influences on the development of their personal identity b. identify shared references and the different connotations attached to them in their own culture and Spanish-speaking cultures	a. identify some of the past and present relationships between Spanish-speaking cultures being studied and their own; e.g., immigration, war	a. identify ethnocentric elements in documents from their own culture

(continued)

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

(continued)

GC–2 affirming diversity

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
GC–2.4 general cultural knowledge	a. recognize that within any culture there are important differences in the way people speak and behave b. recognize some of the factors that affect the culture of a particular region	a. recognize that different cultures may have different interpretations of texts, cultural practices or products	a. describe some causes of communication breakdown and misunderstanding, when communicating with people from an unfamiliar culture
GC–2.5 valuing diversity	a. demonstrate curiosity about other languages and cultures b. recognize and acknowledge different perspectives	a. recognize and acknowledge the value of different perspectives	a. seek out opportunities to interact with people from various cultures who have an interest in the Spanish language and/or Spanish-speaking cultures being studied
GC–2.6 intercultural skills	a. explore representations of their own culture as seen from the outside b. identify and make use of public and private institutions that facilitate contact with other countries and cultures	a. recognize stereotypical thinking	a. use a variety of strategies for dealing with communication breakdowns and misunderstandings when encountering an unfamiliar culture b. identify ethnocentric perspectives in a document or event, and explain their origins

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General Outcome for Global Citizenship
Students will acquire the knowledge, skills and attitudes to be effective **global citizens**, through the exploration of the cultures of the Spanish-speaking world.

GC–3 personal and career opportunities

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
GC–3.1 Spanish language and Spanish-speaking cultures	a. identify aspects of the history, literature, arts and crafts of Spanish-speaking cultures that are of personal interest b. identify some careers that require or would value knowledge of Spanish and Spanish-speaking cultures	a. explore personal reasons for learning Spanish	a. explore opportunities for further education related to Spanish and Spanish-speaking cultures
GC–3.2 cultural and linguistic diversity	a. identify aspects of the history, literature, arts and crafts of different cultures that are of personal interest b. identify some careers that use knowledge of international languages and cultures, and intercultural skills	a. explore personal reasons for learning additional languages and experiencing other cultures	a. explore opportunities for further education related to languages and cultures

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Strategies

language learning

language use

Students will know and use various strategies to maximize the effectiveness of learning and communication.

general learning

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STRATEGIES

Under the Strategies heading are specific outcomes that will help students learn and communicate more **effectively**. Strategic competence has long been recognized as an important component of communicative competence. The learning outcomes that follow deal not only with compensation and repair strategies, important in the early stages of language learning when proficiency is low, but with strategies for language learning, language use in a broader sense, as well as general learning strategies that help students acquire content. Although people may use strategies unconsciously, the learning outcomes deal only with the **conscious use** of strategies.

The strategies are grouped under three cluster headings—see the illustration on the preceding page. Under each of these headings there are several strands that show the development of awareness and skill in using strategies from course to course. Each strand, identified by a strand heading at the left end of the row, deals with a specific category of strategy. Language learning and general learning strategies are categorized as cognitive, metacognitive and social/affective. The language use strategies are organized by communicative mode: interactive, interpretive, productive.

The strategies that students choose depend on the task they are engaged in as well as on other factors, such as their preferred learning style, personality, age, attitude and cultural background. Strategies that work well for one person may not be effective for another person, or may not be suitable in a different situation. For this reason it is not particularly useful to say that students should be aware of, or able to use, a specific strategy in a particular course. Consequently, the specific outcomes describe the students' knowledge of, and ability to use, general types of strategies. More specific strategies for each general category or type are included in the sample list of strategies below. The specific strategies provided in the sample list **are not prescriptive** but are provided as an illustration of how the general strategies in the specific outcomes might be developed.

Teachers need to know and be able to demonstrate a broad range of strategies from which students are then able to choose in order to communicate effectively. Strategies of all kinds are best taught in the context of learning activities where students can apply them immediately and then reflect on their use.

SAMPLE LIST OF STRATEGIES

Language Learning Strategies

Cognitive

- listen attentively
- perform actions to match words of a song, story or rhyme
- learn short rhymes or songs, incorporating new vocabulary or sentence patterns
- imitate sounds and intonation patterns
- memorize new words by repeating them silently or aloud
- seek the precise term to express meaning
- repeat words or phrases in the course of performing a language task
- make personal dictionaries
- experiment with various elements of the language
- use mental images to remember new information
- group together sets of things—vocabulary, structures—with similar characteristics
- identify similarities and differences between aspects of the Spanish language and own language
- look for patterns and relationships
- use previously acquired knowledge to facilitate a learning task
- associate new words or expressions with familiar ones, either in Spanish or in own language
- find information, using reference materials like dictionaries, textbooks and grammars
- use available technological aids to support language learning; e.g., cassette recorders, computers
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember

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- place new words or expressions in a context to make them easier to remember
- use induction to generate rules governing language use
- seek opportunities outside of class to practise and observe
- perceive and note down unknown words and expressions, noting also their context and function
- be aware of cognates whose meanings vary in different languages

Metacognitive
- check copied writing for accuracy
- make choices about how you learn
- rehearse or role-play language
- decide in advance to attend to the learning task
- reflect on learning tasks with the guidance of the teacher
- make a plan in advance about how to approach a language learning task
- reflect on the listening, reading and writing process
- decide in advance to attend to specific aspects of input
- listen or read for key words
- evaluate own performance or comprehension at the end of a task
- keep a learning log
- experience various methods of language acquisition, and identify one or more considered to be particularly useful personally
- be aware of the potential of learning through direct exposure to the language
- know how strategies may enable you to cope with texts containing unknown elements
- identify problems that might hinder successful completion of a task, and seek solutions
- monitor own speech and writing to check for persistent errors
- be aware of own strengths and weaknesses, identify own needs and goals, and organize strategies and procedures accordingly

Social/Affective
- initiate or maintain interaction with others
- participate in shared reading experiences
- seek the assistance of a friend to interpret a text
- reread familiar self-chosen texts to enhance understanding and enjoyment
- work cooperatively with peers in small groups
- understand that making mistakes is a natural part of language learning
- experiment with various forms of expression, and note their acceptance or nonacceptance by more experienced speakers
- participate actively in brainstorming and conferencing as prewriting and postwriting exercises
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- repeat new words and expressions occurring in own conversations, and make use of the new words as soon as appropriate
- reduce anxiety by using mental techniques, such as positive self-talk or humour
- work with others to solve problems, and get feedback on tasks
- provide personal motivation by arranging own rewards when successful

Language Use Strategies

Interactive
- use words from own first language to get meaning across; e.g., use a literal translation of a phrase in the first language, use a first language word but pronounce it as in Spanish
- acknowledge being spoken to
- interpret and use a variety of nonverbal cues to communicate; e.g., mime, pointing, gestures, drawing pictures
- indicate lack of understanding verbally or nonverbally; e.g., *Perdón, no comprendo, ¿cómo?, ¿perdón?, no entiendo,* shrug shoulders
- ask for clarification or repetition when something is not understood; e.g., *¿Qué quiere decir ...?, ¿Puede repetir, por favor?*
- use the other speaker's words in subsequent conversation
- assess feedback from a conversation partner to recognize when a message has not been understood; e.g., partner may shrug shoulders

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- start again, using a different tactic, when communication breaks down; e.g., *Quiero decir que ...*
- use a simple word similar to the concept to convey, and invite correction; e.g., *pescado* for *pez*
- invite others into the discussion; e.g., *¿no?, ¿verdad?*
- ask for confirmation that a form used is correct; e.g., *¿Se puede decir esto?, ¿Se dice así?*
- use a range of fillers, hesitation devices and gambits to sustain conversations; e.g., *Bueno, de hecho ..., pues ..., entonces ...*
- use circumlocution to compensate for lack of vocabulary; e.g., *La máquina que se usa para lavar la ropa* for *lavadora*
- repeat part of what someone has said to confirm mutual understanding; e.g., *Quieres decir que .../Es decir que ...*
- summarize the point reached in a discussion to help focus the talk
- ask follow-up questions to check for understanding; e.g., *¿Me entiende?, ¿Está claro?, ¿Me comprende?*
- use suitable phrases to intervene in a discussion; e.g., *Hablando de .../Perdón, pero ...*
- self-correct if errors lead to misunderstandings; e.g., *Quiero decir que ..., mejor dicho ..., o sea ...*

Interpretive

- use gestures, intonation and visual supports to aid comprehension
- make connections between texts on the one hand and prior knowledge and personal experience on the other
- use illustrations to aid reading comprehension
- determine the purpose of listening
- listen or look for key words
- listen selectively based on purpose
- make predictions about what is expected to be heard or read, based on prior knowledge and personal experience
- use knowledge of the sound–symbol system to aid reading comprehension
- infer probable meanings of unknown words or expressions from contextual clues
- prepare questions or a guide to note down information found in a text
- use key content words or discourse markers to follow an extended text
- reread several times to understand complex ideas
- summarize information gathered
- assess own information needs before listening, viewing or reading
- use skimming and scanning to locate key information in texts

Productive

- mimic what the teacher says
- use nonverbal means to communicate
- copy what others say or write
- use words visible in the immediate environment
- use resources to increase vocabulary
- use familiar repetitive patterns from stories, songs, rhymes or media
- use illustrations to provide detail when producing own texts
- use various techniques to explore ideas at the planning stage, such as brainstorming or keeping a notebook or log of ideas
- use knowledge of sentence patterns to form new sentences
- be aware of and use the steps of the writing process: prewriting (gathering ideas, planning the text, researching, organizing the text), writing, revision (rereading, moving pieces of text, rewriting pieces of text), correction (grammar, spelling, punctuation), publication (reprinting, adding illustrations, binding)
- use a variety of resources to correct texts; e.g., personal and commercial dictionaries, checklists, grammars
- take notes when reading or listening to assist in producing own text
- revise and correct final version of text
- use circumlocution and definition to compensate for gaps in vocabulary
- apply grammar rules to improve accuracy at the correction stage
- compensate for avoiding difficult structures by rephrasing

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General Learning Strategies

Cognitive

- classify objects and ideas according to their attributes; e.g., red objects and blue objects, or animals that eat meat and animals that eat plants
- use models
- connect what is already known with what is being learned
- experiment with and concentrate on one thing at a time
- focus on and complete learning tasks
- record key words and concepts in abbreviated form—verbal, graphic or numerical—to assist with performance of a learning task
- use mental images to remember new information
- distinguish between fact and opinion when using a variety of sources of information
- formulate key questions to guide research
- make inferences, and identify and justify the evidence on which these inferences are based
- use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember
- seek information through a network of sources, including libraries, the Internet, individuals and agencies
- use previously acquired knowledge or skills to assist with a new learning task

Metacognitive

- reflect on learning tasks with the guidance of the teacher
- choose from among learning options
- discover how own efforts can affect learning
- reflect upon own thinking processes and how you learn
- decide in advance to attend to the learning task
- divide an overall learning task into a number of subtasks
- make a plan in advance about how to approach a task
- identify own needs and interests
- manage own physical working environment
- keep a learning journal, such as a diary or a log
- develop criteria for evaluating own work
- work with others to monitor own learning
- take responsibility for planning, monitoring and evaluating learning experiences

Social/Affective

- watch others' actions and copy them
- seek help from others
- follow own natural curiosity and intrinsic motivation to learn
- participate in cooperative group learning tasks
- choose learning activities that enhance understanding and enjoyment
- be encouraged to try, even though mistakes might be made
- take part in group decision-making processes
- use support strategies to help peers persevere at learning tasks; e.g., offer encouragement, praise, ideas
- take part in group problem-solving processes
- use self-talk to feel competent to do the task
- be willing to take risks, and try unfamiliar tasks and approaches
- monitor own level of anxiety about learning tasks, and take measures to lower it if necessary; e.g., deep breathing, laughter
- use social interaction skills to enhance group learning activities

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–1 language learning

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
S–1.1 cognitive	a. select and use a variety of cognitive strategies to enhance language learning; e.g., associate new words or expressions with familiar ones, either in Spanish or in their own language	a. select and use appropriate cognitive strategies to enhance language learning in a variety of situations; e.g., use word maps, mind maps, diagrams, charts or other graphic representations to make information easier to understand and remember	a. evaluate the success of their use of a variety of cognitive strategies to enhance language learning
S–1.2 metacognitive	a. select and use a variety of metacognitive strategies to enhance language learning; e.g., evaluate their own performance or comprehension at the end of a task, keep a learning log	a. select and use appropriate metacognitive strategies to enhance language learning in a variety of situations; e.g., realize the potential of learning through direct exposure to the language, know how strategies may enable coping with texts containing unknown elements	a. evaluate the success of their use of a variety of metacognitive strategies to enhance language learning
S–1.3 social/affective	a. select and use a variety of social and affective strategies to enhance language learning; e.g., use self-talk to make themselves feel competent to do the task	a. select and use appropriate social and affective strategies to enhance language learning in a variety of situations; e.g., repeat new words and expressions that occur in conversations in which they participate, and make use of these new words and expressions as soon as appropriate	a. evaluate the success of their use of a variety of social and affective strategies to enhance language learning

Further examples of language learning strategies are available on pages 30 and 31.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–2 language use

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
S–2.1 interactive	a. select and use a variety of interactive strategies; e.g., invite others into the discussion, ask for confirmation that a form used is correct	a. select and use appropriate interactive strategies in a variety of situations; e.g., repeat part of what someone has said to confirm mutual understanding	a. evaluate the success of their use of a variety of interactive strategies to deal with specific communicative situations; e.g., use of a range of fillers, hesitation devices and gambits to sustain conversations, use of circumlocution to compensate for lack of vocabulary
S–2.2 interpretive	a. select and use a variety of interpretive strategies; e.g., prepare questions or a guide to note down information found in a text	a. select and use appropriate interpretive strategies in a variety of situations; e.g., reread several times to understand complex ideas	a. evaluate the success of their use of a variety of interpretive strategies to deal with specific communicative situations; e.g., use of key content words or discourse markers to follow an extended text
S–2.3 productive	a. select and use a variety of productive strategies; e.g., use resources to increase vocabulary	a. select and use appropriate productive strategies in a variety of situations; e.g., use a variety of resources to correct texts	a. evaluate the success of their use of a variety of productive strategies to deal with specific communicative situations; e.g., taking notes when reading or listening to assist in producing personal texts

Further examples of language use strategies are available on pages 31 and 32.

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General Outcome for Strategies
Students will know and use various strategies to maximize the **effectiveness** of learning and communication.

S–3 general learning

	Spanish Language and Culture 10-6Y	Spanish Language and Culture 20-6Y	Spanish Language and Culture 30-6Y
	Students will be able to:		
S–3.1 cognitive	a. select and use a variety of cognitive strategies to enhance general learning; e.g., use mental images to remember new information	a. select and use appropriate cognitive strategies to enhance general learning in a variety of situations; e.g., formulate key questions to guide research	a. evaluate the success of their use of a variety of cognitive strategies to enhance general learning
S–3.2 metacognitive	a. select and use a variety of metacognitive strategies to enhance general learning; e.g., manage their own physical working environment	a. select and use appropriate metacognitive strategies to enhance general learning in a variety of situations; e.g., keep a learning journal such as a diary or a log	a. evaluate the success of their use of a variety of metacognitive strategies to enhance general learning
S–3.3 social/affective	a. select and use a variety of social and affective strategies to enhance general learning; e.g., use support strategies to help peers persevere at learning tasks	a. select and use appropriate social and affective strategies to enhance general learning in a variety of situations; e.g., take part in group problem-solving processes	a. evaluate the success of their use of a variety of social and affective strategies to enhance general learning

Further examples of general learning strategies are available on page 33.

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SOCIAL STUDIES

CONTENTS

Social Studies 10-1, 10-2

Social Studies 20–30

Social Studies 23–33

SOCIAL STUDIES

The Social Studies Kindergarten to Grade 12 Program of Studies is under revision. Provincial implementation of the new program is as follows:

School Year	Provincial Implementation
2005–2006	Kindergarten Grade 1 Grade 2 Grade 3
2006–2007	Grade 4 Grade 7
2007–2008	**Grade 5** **Grade 8** **Grade 10: 10-1, 10-2**
2008–2009	Grade 6 (optional) Grade 9 (optional) Grade 11: 11-1, 11-2
2009–2010	Grade 6 Grade 9 Grade 12: 12-1, 12-2

Note: For the 2007–2008 school year, the **new provincially implemented** Social Studies 10-1 program of studies (2007) replaces pages 9 to 24 in the existing 10–20–30 (Revised 2000) program of studies and the Social Studies 10-2 program of studies (2007) replaces pages 9 to 24 in the existing 13–23–33 (Revised 2000) program of studies.

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SOCIAL STUDIES KINDERGARTEN TO GRADE 12

PROGRAM RATIONALE AND PHILOSOPHY

Social studies provides opportunities for students to develop the attitudes, skills and knowledge that will enable them to become engaged, active, informed and responsible citizens. Recognition and respect for individual and collective identity is essential in a pluralistic and democratic society. Social studies helps students develop their sense of self and community, encouraging them to affirm their place as citizens in an inclusive, democratic society.

PROGRAM VISION

The Alberta Social Studies Kindergarten to Grade 12 Program of Studies meets the needs and reflects the nature of 21st century learners. It has at its heart the concepts of citizenship and identity in the Canadian context. The program reflects multiple perspectives, including Aboriginal and Francophone, that contribute to Canada's evolving realities. It fosters the building of a society that is pluralistic, bilingual, multicultural, inclusive and democratic. The program emphasizes the importance of diversity and respect for differences as well as the need for social cohesion and the effective functioning of society. It promotes a sense of belonging and acceptance in students as they engage in active and responsible citizenship at the local, community, provincial, national and global level.

Central to the vision of the Alberta social studies program is the recognition of the diversity of experiences and perspectives and the pluralistic nature of Canadian society. Pluralism builds upon Canada's historical and constitutional foundations, which reflect the country's Aboriginal heritage, bilingual nature and multicultural realities. A pluralistic view recognizes that citizenship and identity are shaped by multiple factors such as culture, language, environment, gender, ideology, religion, spirituality and philosophy.

DEFINITION OF SOCIAL STUDIES

Social studies is the study of people in relation to each other and to their world. It is an issues-focused and inquiry-based interdisciplinary subject that draws upon history, geography, ecology, economics, law, philosophy, political science and other social science disciplines. Social studies fosters students' understanding of and involvement in practical and ethical issues that face their communities and humankind. Social studies is integral to the process of enabling students to develop an understanding of who they are, what they want to become and the society in which they want to live.

THE ROLE OF SOCIAL STUDIES

Social studies develops the key values and attitudes, knowledge and understanding, and skills and processes necessary for students to become active and responsible citizens, engaged in the democratic process and aware of their capacity to effect change in their communities, society and world.

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VALUES AND ATTITUDES

Social studies provides learning opportunities for students to:

- value the diversity, respect the dignity and support the equality of all human beings
- demonstrate social compassion, fairness and justice
- appreciate and respect how multiple perspectives, including Aboriginal and Francophone, shape Canada's political, socio-economic, linguistic and cultural realities
- honour and value the traditions, concepts and symbols that are the expression of Canadian identity
- thrive in their evolving identity with a legitimate sense of belonging to their communities, Canada and the world
- demonstrate a global consciousness with respect to humanity and world issues
- demonstrate a consciousness for the limits of the natural environment, stewardship for the land and an understanding of the principles of sustainability
- value lifelong learning and opportunities for careers in the areas of social studies and the social sciences.

KNOWLEDGE AND UNDERSTANDING

Social studies provides learning opportunities for students to:

- understand their rights and responsibilities in order to make informed decisions and participate fully in society
- understand the unique nature of Canada and its land, history, complexities and current issues
- understand how knowledge of the history of Alberta, of Canada and of the world, contributes to a better comprehension of contemporary realities
- understand historic and contemporary issues, including controversial issues, from multiple perspectives
- understand the diversity of Aboriginal traditions, values and attitudes
- understand contemporary challenges and contributions of Aboriginal peoples in urban, rural, cultural and linguistic settings
- understand the historical and contemporary realities of Francophones in Canada
- understand the multiethnic and intercultural makeup of Francophones in Canada
- understand the challenges and opportunities that immigration presents to newcomers and to Canada
- understand how social cohesion can be achieved in a pluralistic society
- understand how political and economic distribution of power affects individuals, communities and nations
- understand the role of social, political, economic and legal institutions as they relate to individual and collective well-being and a sustainable society
- understand how opportunities and responsibilities change in an increasingly interdependent world
- understand that humans exist in a dynamic relationship with the natural environment.

SKILLS AND PROCESSES

Social studies provides learning opportunities for students to:

- engage in active inquiry and critical and creative thinking
- engage in problem solving and conflict resolution with an awareness of the ethical consequences of decision making
- apply historical and geographic skills to bring meaning to issues and events
- use and manage information and communication technologies critically
- conduct research ethically using varied methods and sources; organize, interpret and present their findings; and defend their opinions
- apply skills of metacognition, reflecting upon what they have learned and what they need to learn
- recognize and responsibly address injustices as they occur in their schools, communities, Canada and the world
- communicate ideas and information in an informed, organized and persuasive manner.

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PROGRAM FOUNDATIONS

The program of studies provides a foundation of learning experiences that address critical aspects of social studies and its application. These critical areas provide general direction for the program of studies and identify major components of its structure.

CORE CONCEPTS OF CITIZENSHIP AND IDENTITY

The dynamic relationship between citizenship and identity forms the basis for skills and learning outcomes in the program of studies.

The goal of social studies is to provide learning opportunities for students to:

- understand the principles underlying a democratic society
- demonstrate a critical understanding of individual and collective rights
- understand the commitment required to ensure the vitality and sustainability of their changing communities at the local, provincial, national and global levels
- validate and accept differences that contribute to the pluralistic nature of Canada
- respect the dignity and support the equality of all human beings.

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The sense of being a citizen, enjoying individual and collective rights and equitable status in contemporary society, impacts an individual's sense of identity. Individuals need to feel that their identities are viewed as legitimate before they can contribute to the public good and feel a sense of belonging and empowerment as citizens.

Social studies provides learning opportunities for students to:

- understand the complexity of identity formation in the Canadian context
- understand how identity and self-esteem are shaped by multiple personal, social, linguistic and cultural factors
- demonstrate sensitivity to the personal and emotional aspects of identity
- demonstrate skills required to maintain individuality within a group
- understand that with empowerment comes personal and collective responsibility for the public good.

SOCIAL STUDIES AND ABORIGINAL PERSPECTIVES AND EXPERIENCES

For historical and constitutional reasons, an understanding of Canada requires an understanding:

- of Aboriginal perspectives
- of Aboriginal experiences
- that Aboriginal students have particular needs and requirements.

Central to Aboriginal identity are languages and cultures that link each group with its physical world, worldviews and traditions. The role of Elders and community leaders is essential in this linkage.

The social studies program of studies provides learning opportunities that contribute to the development of self-esteem and identity in Aboriginal students by:

- promoting and encouraging a balanced and holistic individual and strengthening individual capacity
- honouring and valuing the traditions, concepts and symbols that are the expression of their identity
- providing opportunities for students to express who they are with confidence as they interact and engage with others
- contributing to the development of active and responsible members of groups and communities.

SOCIAL STUDIES AND FRANCOPHONE PERSPECTIVES AND EXPERIENCES

For historical and constitutional reasons, an understanding of Canada requires an understanding:

- of Francophone perspectives
- of Francophone experiences
- that Francophone students have particular needs and requirements.

Social studies occupies a central position in successful Francophone education in Alberta. Francophone schools are a focal point of the Francophone community. They meet the needs and aspirations of parents by ensuring the vitality of the community. For students enrolled in Francophone schools, the social studies program will:

- strengthen Francophone self-esteem and identity
- encourage students to actively contribute to the flourishing of Francophone culture, families and communities
- promote partnerships among the home, community and business world
- engage students in participating in the bilingual and multicultural nature of Canada.

PLURALISM: DIVERSITY AND COHESION

One of the goals of the social studies program is to foster understanding of the roles and contributions of linguistic, cultural and ethnic groups in Canada. Students will learn about themselves in relation to others. Social studies helps students to function

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as citizens in a society that values diversity and cohesion.

A key component of effective social organizations, communities and institutions is recognition of diversity of experiences and perspectives. The program of studies emphasizes how diversity and differences are assets that enrich our lives. Students will have opportunities to value diversity, to recognize differences as positive attributes and to recognize the evolving nature of individual identities. Race, socio-economic conditions and gender are among various forms of identification that people live with and experience in a variety of ways.

Social studies addresses diversity and social cohesion and provides processes that students can use to work out differences, drawing on the strengths of diversity. These processes include:

- a commitment to respecting differences and fostering inclusiveness
- an understanding and appreciation for shared values
- a respect for democratic principles and processes for decision making such as dialogue and deliberation.

Diversity contributes to the development of a vibrant democratic society. Through the interactions of place and historical processes of change, diversity has been an important asset in the evolution of Canadian society. Some key manifestations of this diversity include:

- First Nations, Inuit and Métis cultures
- official bilingualism
- immigration
- multiculturalism.

Accommodation of diversity is essential for fostering social cohesion in a pluralistic society. Social cohesion is a process that requires the development of the relationships within and among communities. Social cohesion is manifested by respect for:

- individual and collective rights
- civic responsibilities
- shared values
- democracy
- rule of law
- diversity.

SOCIAL STUDIES: LEARNERS AND LEARNING

Students bring their own perspectives, cultures and experiences to the social studies classroom. They construct meaning in the context of their lived experience through active inquiry and engagement with their school and community. In this respect, the infusion of current events, issues and concerns is an essential component of social studies.

Social studies recognizes the interconnections and interactions among school, community, provincial, national and global institutions.

The Alberta program of studies for social studies provides learning opportunities for students to develop skills of active and responsible citizenship and the capacity to inquire, make reasoned and informed judgments, and arrive at decisions for the public good.

Students become engaged and involved in their communities by:

- asking questions
- making connections with their local community
- writing letters and articles
- sharing ideas and understandings
- listening to and collaborating and working with others to design the future
- empathizing with the viewpoints and positions of others
- creating new ways to solve problems.

ISSUES-FOCUSED APPROACH TO TEACHING SOCIAL STUDIES

A focus on issues through deliberation is intrinsic to the multidisciplinary nature of social studies and to democratic life in a pluralistic society. An issues-focused approach presents opportunities to

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address learning outcomes by engaging students in active inquiry and application of knowledge and critical thinking skills. These skills help students to identify the relevance of an issue by guiding them to develop informed positions and respect for the positions of others. This process enables students to question, validate, expand and express their understanding; to challenge their presuppositions; and to construct their own points of view.

The program of studies is designed to promote metacognition through critical reflection, questioning, decision making and consideration of multiple perspectives on issues. Through this process, students will strive to understand and explain the world in the present and to determine what kind of world they want in the future.

Current Affairs

Social studies fosters the development of citizens who are informed and engaged in current affairs. Accordingly, current affairs play a central role in learning and are integrated throughout the program. Ongoing reference to current affairs adds relevance, interest and immediacy to social studies issues. Investigating current affairs from multiple perspectives motivates students to engage in meaningful dialogue on relevant historical and contemporary issues, helping them to make informed and reasoned decisions on local, provincial, national and global issues.

An issues-focused approach that incorporates multiple perspectives and current affairs helps students apply problem-solving and decision-making skills to real-life and controversial issues.

In order to allow opportunities for students to engage in current affairs, issues and concerns of a local nature, the program of studies provides the flexibility to include these topics within the time allotted for social studies.

Opportunities may include:

- current events in local communities
- issues with local, provincial, national and/or global relevance
- cultural celebrations
- visits from dignitaries
- special events.

Controversial Issues

Controversial issues are those topics that are publicly sensitive and upon which there is no consensus of values or beliefs. They include topics on which reasonable people may sincerely disagree. Opportunities to deal with these issues are an integral part of social studies education in Alberta.

Studying controversial issues is important in preparing students to participate responsibly in a democratic and pluralistic society. Such study provides opportunities to develop the ability to think clearly, to reason logically, to open-mindedly and respectfully examine different points of view and to make sound judgments.

Controversial issues that have been anticipated by the teacher, and those that may arise incidentally during instruction, should be used by the teacher to promote critical inquiry and teach thinking skills.

STRANDS OF SOCIAL STUDIES

Learning related to the core concepts of citizenship and identity is achieved through focused content at each grade level. The six strands of social studies reflect the interdisciplinary nature of social studies. The strands are interrelated and constitute the basis for the learning outcomes in the program of studies.

Time, Continuity and Change

Understanding the dynamic relationships among time, continuity and change is a cornerstone of citizenship and identity. Considering multiple perspectives on history, and contemporary issues within their historical context, enables students to understand and appreciate the social, cultural and political dimensions of the past, make meaning of the present and make decisions for the future.

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The Land: Places and People

Exploring the unique and dynamic relationship that humans have with the land, places and environments affects decisions that students make and their understanding of perspectives, issues, citizenship and identity. Students will examine the impact of physical geography on the social, political, environmental and economic organization of societies. This examination also affects students' understanding of perspectives and issues as they consider how connections to the land influence their sense of place.

Power, Authority and Decision Making

Examining the concepts of power, authority and decision making from multiple perspectives helps students consider how these concepts impact individuals, relationships, communities and nations. It also broadens students' understanding of related issues, perspectives and their effect on citizenship and identity. A critical examination of the distribution, exercise and implications of power and authority is the focus of this strand. Students will examine governmental and political structures, justice and laws, fairness and equity, conflict and cooperation, decision-making processes, leadership and governance. This examination develops a student's understanding of the individual's capacity in decision-making processes and promotes active and responsible citizenship.

Economics and Resources

Exploring multiple perspectives on the use, distribution and management of resources and wealth contributes to students' understanding of the effects that economics and resources have on the quality of life around the world. Students will explore basic economic systems, trade and the effects of economic interdependence on individuals, communities, nations and the natural environment. Students will also critically consider the social and environmental implications of resource use and technological change.

Global Connections

Critically examining multiple perspectives and connections among local, national and global issues develops students' understanding of citizenship and identity and the interdependent or conflicting nature of individuals, communities, societies and nations. Exploring this interdependence broadens students' global consciousness and empathy with world conditions. Students will also acquire a better comprehension of tensions pertaining to economic relationships, sustainability and universal human rights.

Culture and Community

Exploring culture and community allows students to examine shared values and their own sense of belonging, beliefs, traditions and languages. This promotes students' development of citizenship and identity and understanding of multiple perspectives, issues and change. Students will examine the various expressions of their own and others' cultural, linguistic and social communities.

GENERAL AND SPECIFIC OUTCOMES

The general and specific outcomes provide an organizational structure for assessment of student progress in the social studies program. These outcomes follow the progression of learning that occurs at each grade level.

General Outcomes

General outcomes identify what students are expected to know and be able to do upon completion of a grade/course. General outcomes have been identified within each grade/course.

Specific Outcomes

Specific outcomes identify explicit components of values and attitudes, knowledge and understanding, and skills and processes that are contained within each general outcome within each grade/course. Specific outcomes are building blocks that enable students to achieve general outcomes for each grade/course. Where

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appropriate, examples have been identified as an optional (e.g.) or required (i.e.) component of the specific outcome. At the 10–12 levels, all bracketed items are required components of the specific outcome.

OUTCOMES RELATED TO VALUES AND ATTITUDES

The goal of social studies is to foster the development of values and attitudes that enable students to participate actively and responsibly as citizens in a changing and pluralistic society. Attitudes are an expression of values and beliefs about an issue or topic. Respect, a sense of personal and collective responsibility, and an appreciation of human interdependence are fundamental to citizenship and identity within local, national and global communities. Developing an ethic of care toward self, others and the natural world is central to these commitments.

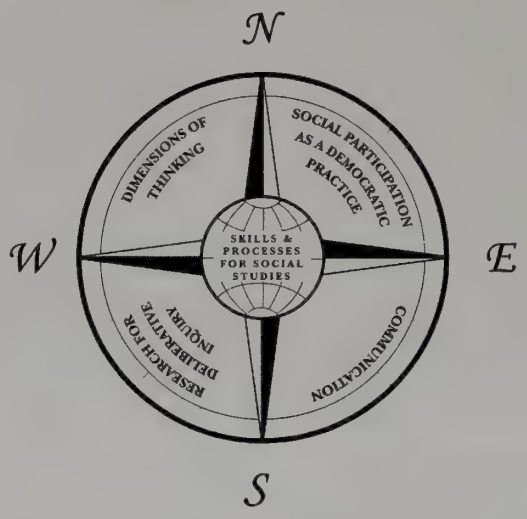
OUTCOMES RELATED TO KNOWLEDGE AND UNDERSTANDING

Outcomes related to knowledge and understanding are fundamental to informed decision making. Knowledge and understanding involve the breadth and depth of information, concepts, evidence, ideas and opinions.

OUTCOMES RELATED TO SKILLS AND PROCESSES

The specific outcomes for skills and processes provide opportunities for students to apply their learning to relevant situations and to develop, practise and maintain essential skills as their learning evolves within a grade/course and from grade to grade/course to course. The skill outcomes are grouped into the following categories for organizational purposes:

- Dimensions of Thinking
- Social Participation as a Democratic Practice
- Research for Deliberative Inquiry
- Communication



Dimensions of Thinking

In social studies, students acquire and develop thinking strategies that assist them in making connections to prior knowledge, in assimilating new information and in applying learning to new contexts. The following dimensions of thinking have been identified as key components in social studies learning:

Critical Thinking
Critical thinking is a process of inquiry, analysis and evaluation resulting in a reasoned judgment. Critical thinking promotes the development of democratic citizenship. Students will develop skills of critical thinking that include: distinguishing fact from opinion; considering the reliability and accuracy of information; determining diverse points of view, perspective and bias; and considering the ethics of decisions and actions.

Creative Thinking
Creative thinking occurs when students identify unique connections among ideas and suggest insightful approaches to social studies questions and issues. Through creative thinking, students generate an inventory of possibilities; anticipate outcomes; and combine logical, intuitive and divergent thought.

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Historical Thinking
Historical thinking is a process whereby students are challenged to rethink assumptions about the past and to reimagine both the present and the future. It helps students become well-informed citizens who approach issues with an inquiring mind and exercise sound judgment when presented with new information or a perspective different from their own. Historical thinking skills involve the sequencing of events, the analysis of patterns and the placement of events in context to assist in the construction of meaning and understanding, and can be applied to a variety of media, such as oral traditions, print, electronic text, art and music.

Historical thinking allows students to develop a sense of time and place to help define their identities. Exploring the roots of the present ensures the transmission and sharing of values, and helps individuals to realize that they belong to a civil society. Historical thinking develops citizens willing to engage in a pluralistic democracy and to promote and support democratic institutions.

Geographic Thinking
Possessing geographic thinking skills provides students with the tools to address social studies issues from a geographic perspective. Geographic thinking skills involve the exploration of spatial orders, patterns and associations. They enable students to investigate environmental and societal issues using a range of geographic information. Developing these spatial skills helps students understand the relationships among people, events and the context of their physical environment, which will assist them to make choices and act wisely when confronted with questions affecting the land and water resources.

Decision Making and Problem Solving
Students develop the ability to make timely and appropriate decisions by identifying the need for a decision, then weighing the advantages, disadvantages and consequences of various alternatives. Decision making involves reserving judgments until all the options and perspectives have been explored; seeking clarity for a variety of choices and perspectives; examining the cause-and-effect relationship between choices; and basing decisions on knowledge, values and beliefs.

Problem-solving processes in social studies help students develop the ability to identify or pose problems and apply learning to consider the causes and dimensions of problems. These skills help develop thinking strategies, allowing students to determine possible courses of action and consequences of potential solutions for a problem that may have multiple or complex causes and that may not have a clear solution. Activities such as simulations, debates, public presentations and editorial writing foster the development of these skills.

Metacognition
Metacognition is "thinking about thinking." It involves critical self-awareness, conscious reflection, analysis, monitoring and reinvention. Students assess the value of the learning strategies they have used, modify them or select new strategies, and monitor the use of reinvented or new strategies in future learning situations. In this respect, students become knowledge creators and contribute to a shared understanding of the world we live in—a key feature of democratic life and commitment to pluralism.

Social Participation as a Democratic Practice

Social participation skills enable students to develop effective relationships with others, to work in cooperative ways toward common goals and to collaborate with others for the well-being of their communities. Students will develop interpersonal skills that focus on cooperation, conflict resolution, consensus building, collaborative decision making, the importance of responsibility and the acceptance of differences. Development of these skills will enhance active participation in their communities. Activities in this regard could include social action and community projects, e.g., church groups, Amnesty International, Médecins sans frontières (Doctors Without Borders).

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Research for Deliberative Inquiry

Purposeful deliberation and critical reflection are essential skills and processes for democratic citizenship and problem solving. In social studies, the research process develops learners who are independent, self-motivated problem solvers and co-creators of knowledge. Developing research skills prepares students for the world of work, post-secondary studies, lifelong learning and citizenship in a complex world. These skills also enhance and enrich the process of identity formation as students critically reflect on their sense of self and relationship to others. The foundations of the research process are the application of acquired skills, the selection of appropriate resources and the use of suitable technology.

The Infusion of Technology

Technology encompasses the processes, tools and techniques that alter human activity. Information communication technology provides a vehicle for communicating, representing, inquiring, making decisions and solving problems. It involves the processes, tools and techniques for:

- gathering and identifying information
- re-representations of dominant texts
- expressing and creating
- classifying and organizing
- analyzing and evaluating
- speculating and predicting.

Selected curriculum outcomes from Alberta Learning's Information and Communication Technology (ICT) Program of Studies are infused throughout the social studies program of studies and are indicated by this symbol ➢. Further information regarding the Information and Communication Technology Program of Studies is contained within that program of studies.

Communication

Communication skills enable students to comprehend, interpret and express information and ideas clearly and purposefully. These skills include the language arts of listening, speaking, reading, writing, viewing and representing, as well as the use of communication technologies for acquiring and exchanging information and ideas.

Oral, Written and Visual Literacy

Through the language arts, human beings communicate thoughts, feelings, experiences, information and opinions and learn to understand themselves and others. Speaking, writing and representing are used in the social studies program to relate a community's stories and to convey knowledge, beliefs, values and traditions through narrative history, music, art and literature.

Reading, listening and viewing in social studies enables students to extend their thinking and their knowledge and to increase their understanding of themselves and others. These skills provide students with a means of accessing the ideas, perspectives and experiences of others.

The language arts enable students to explore, organize and clarify thoughts and to communicate these thoughts to others.

Media Literacy Skills

Contemporary texts often involve more than one medium to communicate messages and as such, are often complex, having multi-layered meanings. Information texts include visual elements such as charts, graphs, diagrams, photographs, tables, pictures, collages and timelines. Media literacy skills involve accessing, interpreting and evaluating mass media texts such as newspapers, television, the Internet and advertising. Media literacy in social studies explores concepts in mass media texts, such as identifying key messages and multiple points of view that are being communicated, detecting bias, and examining the responsibility of citizens to respond to media texts.

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SCOPE AND SEQUENCE

The core concepts and six strands of the Alberta Social Studies Kindergarten to Grade 12 Program of Studies are reflected in each grade/course. The structure provides continuity and linkages from grade to grade/course to course. In addition, the general outcomes in each grade/course are components of the one central theme reflected in the grade/course title.

Grade	Grade Title and General Outcomes	Linkages and Sequencing
Kindergarten	**Being Together** K.1 I Am Unique K.2 I Belong	Kindergarten emphasizes a strong sense of identity and self-esteem and is a student's introduction to citizenship.
One	**Citizenship: Belonging and Connecting** 1.1 My World: Home, School, Community 1.2 Moving Forward with the Past: My Family, My History and My Community	Grade 1 is an introduction to active and responsible citizenship and introduces the concept of community. The concept of historical thinking is applied to the study of community.
Two	**Communities in Canada** 2.1 Canada's Dynamic Communities 2.2 A Community in the Past	Grade 2 expands on the concept of community through an examination of specific characteristics of communities in Canada. Building on the introduction of historical thinking in Grade 1, Grade 2 students will examine how a community changes over time.
Three	**Connecting with the World** 3.1 Communities in the World 3.2 Global Citizenship	Grade 3 continues to build on the knowledge of community and citizenship by examining diverse communities in the world. Grade 3 students will be introduced to the concepts of global citizenship and quality of life.
Four	**Alberta: The Land, Histories and Stories** 4.1 Alberta: A Sense of the Land 4.2 The Stories, Histories and People of Alberta 4.3 Alberta: Celebrations and Challenges	Grade 4 introduces specific geographic skills through an examination of Alberta and its cultural and geographic diversity. Linkages to literature and the continued development of historical thinking are reinforced through stories and legends. Archaeology and paleontology are also introduced in Grade 4 to further develop historical thinking skills.
Five	**Canada: The Land, Histories and Stories** 5.1 Physical Geography of Canada 5.2 Histories and Stories of Ways of Life in Canada 5.3 Canada: Shaping an Identify	Grade 5 examines the foundations of Canada through its physical geography, the ways of life and heritage of its diverse peoples. Grade 5 presents events and issues that have impacted citizenship and identity in the Canadian context over time.
Six	**Democracy: Action and Participation** 6.1 Citizens Participating in Decision Making 6.2 Historical Models of Democracy: Ancient Athens and the Iroquois Confederacy	Grade 6 emphasizes the importance of active and responsible participation as the foundation of a democratic society. Students will examine how the underlying principles of democracy in Canada compare to those of Ancient Athens and the Iroquois Confederacy.

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(continued)

Grade	Grade Title and General Outcomes	Linkages and Sequencing
Seven	**Canada: Origins, Histories and Movement of People** 7.1 Toward Confederation 7.2 Following Confederation: Canadian Expansions	Grade 7 provides a comprehensive examination of Canadian history preceding and following Confederation. The concept of intercultural contact is introduced through an examination of migration and immigration. Grade 7 forms the foundation for the continued dialogue on citizenship and identity in Canada.
Eight	**Historical Worldviews Examined** 8.1 From Isolation to Adaptation: Japan 8.2 Origins of a Western Worldview: Renaissance Europe 8.3 Worldviews in Conflict: The Spanish and the Aztecs	Grade 8 expands on the concept of intercultural contact and continues to develop historical thinking skills through an examination of past societies in different parts of the world.
Nine	**Canada: Opportunities and Challenges** 9.1 Issues for Canadians: Governance and Rights 9.2 Issues for Canadians: Economic Systems in Canada and the United States	Grade 9 focuses on citizenship, identity and quality of life and how they are impacted by political and legislative processes in Canada. The role of economic systems in Canada and the United States will also be examined.

Senior High School Course Titles	Linkages and Sequencing
10-1 Perspectives on Globalization **10-2 Living in a Globalizing World**	Grade 10 explores multiple perspectives on the origins of globalization and the local, national and international impacts of globalization on identity, lands, cultures, economies, human rights and quality of life.
20-1 Perspectives on Nationalism **20-2 Understandings of Nationalism**	Grade 11 explores the complexities of nationalism in Canadian and international contexts and includes study of the origins of nationalism and the influence of nationalism on regional, international and global relations.
30-1 Perspectives on Ideology **30-2 Understandings of Ideologies**	Grade 12 explores the origins and complexities of ideologies. Students will investigate, analyze and evaluate government policies and actions and develop individual and collective responses to contemporary local, national and global issues.

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SOCIAL STUDIES 10-1: Perspectives on Globalization

Overview

Students will explore multiple perspectives on the origins of globalization and the local, national and international impacts of globalization on lands, cultures, economies, human rights and quality of life. Students will examine the relationships among globalization, citizenship and identity to enhance skills for citizenship in a globalizing world. The infusion of multiple perspectives will allow students to examine the effects of globalization on peoples in Canada and throughout the world, including the impact on Aboriginal and Francophone communities.

Rationale

Globalization, the process by which the world's citizens are becoming increasingly connected and interdependent, demands that students explore responsibilities associated with local and global citizenship and formulate individual responses to emergent issues related to globalization. Recognizing and appreciating the influence of globalization will lead students to develop individual and collective responses to emergent issues.

Key Issue	Key Outcome
To what extent should we embrace globalization?	**Students will understand, assess and respond to the complexities of globalization.**
Related Issues	**General Outcomes**
1. To what extent should globalization shape identity?	Students will explore the impacts of globalization on their lives.
2. To what extent should contemporary society respond to the legacies of historical globalization?	Students will assess the impacts of historical globalization on Indigenous and non-Indigenous peoples.
3. To what extent does globalization contribute to sustainable prosperity for all people?	Students will assess economic, environmental and other contemporary impacts of globalization.
4. To what extent should I, as a citizen, respond to globalization?	Students will assess their roles and responsibilities in a globalizing world.

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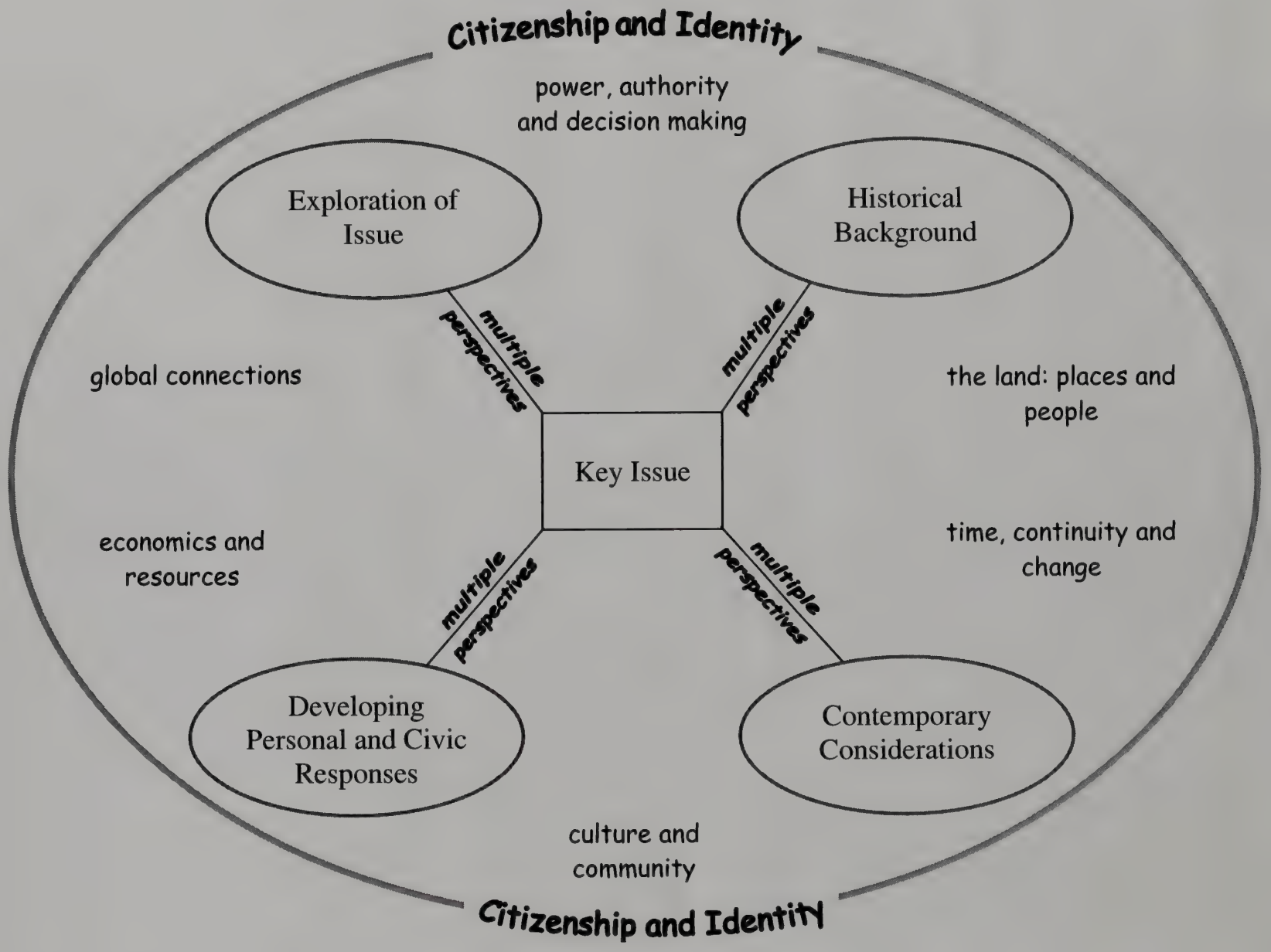
SENIOR HIGH SCHOOL SOCIAL STUDIES COURSE ORGANIZER



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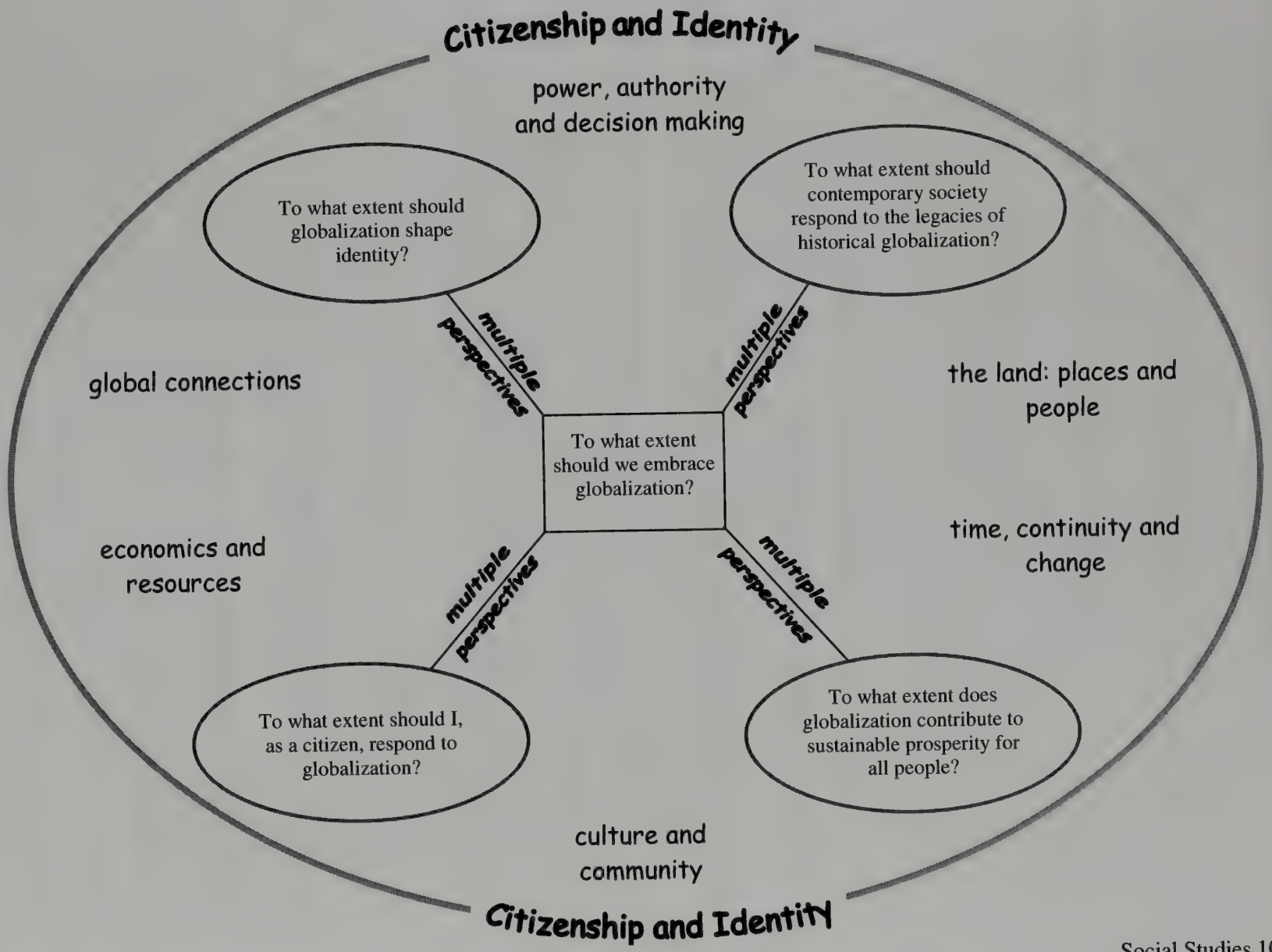
SOCIAL STUDIES 10-1 COURSE ORGANIZER


Citizenship and Identity
power, authority and decision making
To what extent should globalization shape identity?
To what extent should contemporary society respond to the legacies of historical globalization?
multiple perspectives
multiple perspectives
global connections
the land: places and people
To what extent should we embrace globalization?
economics and resources
time, continuity and change
multiple perspectives
multiple perspectives
To what extent should I, as a citizen, respond to globalization?
To what extent does globalization contribute to sustainable prosperity for all people?
culture and community
Citizenship and Identity

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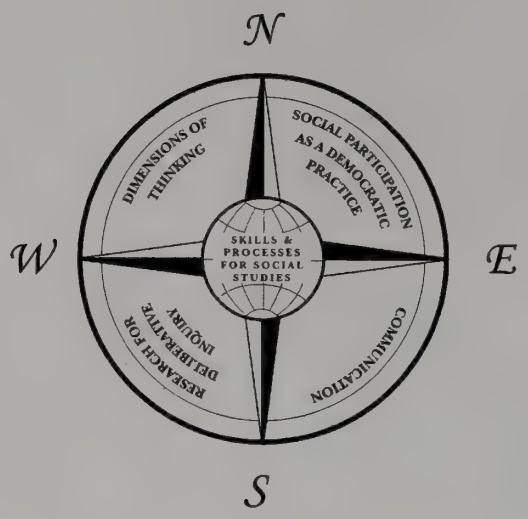

Benchmark Skills and Processes

The following benchmark skills and processes are outcomes to be achieved by the end of Social Studies 30-1.

Dimensions of Thinking	
critical thinking and creative thinking	evaluate ideas and information from multiple sources
historical thinking	analyze multiple historical and contemporary perspectives within and across cultures
geographic thinking	analyze the impact of physical and human geography on history
decision making and problem solving	demonstrate leadership in groups to achieve consensus, solve problems, formulate positions and take action, if appropriate, on important issues
Social Participation as a Democratic Practice	
cooperation, conflict resolution and consensus building	demonstrate leadership by initiating and employing various strategies to resolve conflicts peacefully and equitably
age-appropriate behaviour for social involvement	demonstrate leadership by engaging in actions that enhance personal and community well-being
Research for Deliberative Inquiry	
research and information	develop, express and defend an informed position on an issue
Communication	
oral, written and visual literacy	communicate effectively to express a point of view in a variety of situations
media literacy	assess the authority, reliability and validity of electronically accessed information

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SKILLS AND PROCESSES FOR SOCIAL STUDIES 10-1

The following skills and processes are outcomes to be achieved within the contexts of Social Studies 10-1. Selected Information and Communication Technology (ICT) outcomes are suggested throughout the program and are indicated by this symbol ➢.

DIMENSIONS OF THINKING

Students will:

S.1 develop skills of critical thinking and creative thinking:

- evaluate ideas and information from multiple sources
- determine relationships among multiple and varied sources of information
- assess the validity of information based on context, bias, sources, objectivity, evidence or reliability
- predict likely outcomes based on factual information
- evaluate personal assumptions and opinions to develop an expanded appreciation of a topic or an issue
- synthesize information from contemporary and historical issues to develop an informed position
- evaluate the logic of assumptions underlying a position
- assemble seemingly unrelated information to support an idea or to explain an event
- analyze current affairs from a variety of perspectives

S.2 develop skills of historical thinking:

- analyze multiple historical and contemporary perspectives within and across cultures
- analyze connections among patterns of historical change by identifying cause and effect relationships
- analyze similarities and differences among historical narratives
- evaluate the impact of significant historical periods and patterns of change on the contemporary world
- discern historical facts from historical interpretations through an examination of multiple sources
- identify reasons underlying similarities and differences among historical narratives
- develop a reasoned position that is informed by historical and contemporary evidence
- ➢ demonstrate an understanding of how changes in technology can benefit or harm society—in the context of the present, the future and various historical time periods
- ➢ use current, reliable information sources from around the world

S.3 develop skills of geographic thinking:

- analyze the impact of physical and human geography on history
- make inferences and draw conclusions from maps and other geographical sources
- locate, gather, interpret and organize information, using historical maps
- develop and assess geographical representations to demonstrate the impact of factors of geography on world events
- assess the impact of human activities on the land and the environment
- assess how human interaction impacts geopolitical realities
- ➢ use current, reliable information sources from around the world, including online atlases

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S.4 demonstrate skills of decision making and problem solving:

- demonstrate leadership in groups to achieve consensus, solve problems, formulate positions and take action, if appropriate, on important issues
- develop inquiry strategies to make decisions and solve problems
- generate and apply new ideas and strategies to contribute to decision making and problem solving
- ➢ describe a plan of action to use technology to solve a problem
- ➢ use appropriate tools and materials to accomplish a plan of action

SOCIAL PARTICIPATION AS A DEMOCRATIC PRACTICE

Students will:

S.5 demonstrate skills of cooperation, conflict resolution and consensus building:

- demonstrate leadership by initiating and employing various strategies to resolve conflicts peacefully and equitably
- participate in persuading, compromising and negotiating to resolve conflicts and differences
- interpret patterns of behaviour and attitudes that contribute or pose obstacles to cross-cultural understanding
- demonstrate leadership during discussions and group work
- respect the points of view and perspectives of others
- collaborate in groups to solve problems

S.6 develop age-appropriate behaviour for social involvement as responsible citizens contributing to their community:

- demonstrate leadership by engaging in actions that enhance personal and community well-being
- acknowledge the importance of multiple perspectives in a variety of situations

RESEARCH FOR DELIBERATIVE INQUIRY

Students will:

S.7 apply the research process:

- develop, express and defend an informed position on an issue
- reflect on changes of points of view or opinion based on information gathered and research conducted
- draw pertinent conclusions based on evidence derived from research
- demonstrate proficiency in the use of research tools and strategies to investigate issues
- consult a wide variety of sources, including oral histories, that reflect varied perspectives on particular issues
- integrate and synthesize argumentation and evidence to provide an informed opinion on a research question or an issue of inquiry
- develop, refine and apply questions to address an issue
- select and analyze relevant information when conducting research
- ➢ plan and perform complex searches, using digital sources
- ➢ use calendars, time management or project management software to assist in organizing the research process
- ➢ generate new understandings of issues by using some form of technology to facilitate the process
- ➢ record relevant data for acknowledging sources of information, and cite sources correctly
- ➢ respect ownership and integrity of information

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COMMUNICATION

Students will:

S.8 demonstrate skills of oral, written and visual literacy:

- communicate effectively to express a point of view in a variety of situations
- use skills of formal and informal discussion and/or debate to persuasively express informed viewpoints on an issue
- ask respectful and relevant questions of others to clarify viewpoints
- listen respectfully to others
- use a variety of oral, written and visual sources to present informed positions on issues
- ➢ apply information technologies for context (situation, audience and purpose) to extend and communicate understanding of complex issues
- ➢ use appropriate presentation software to demonstrate personal understandings
- ➢ compose, revise and edit text
- ➢ apply general principles of graphic layout and design to a document in process
- ➢ understand that different types of information may be used to manipulate and control a message (e.g., graphics, photographs, graphs, charts and statistics)
- ➢ apply principles of graphic design to enhance meaning and engage audiences

S.9 develop skills of media literacy:

- ➢ assess the authority, reliability and validity of electronically accessed information
- ➢ evaluate the validity of various points of view presented in the media
- ➢ appraise information from multiple sources, evaluating each source in terms of the author's perspective or bias and use of evidence
- ➢ analyze the impact of various forms of media, identifying complexities and discrepancies in the information and making distinctions between sound generalizations and misleading oversimplification
- ➢ demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic

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Social Studies 10-1

Key Issue: ***To what extent should we embrace globalization?***

Related Issue 1

To what extent should globalization shape identity?

General Outcome

Students will explore the impacts of globalization on their lives.

Specific Outcomes

▸ Values and Attitudes

Students will:

1.1 acknowledge and appreciate the existence of multiple perspectives in a globalizing world (GC, CC)

1.2 appreciate why peoples in Canada and other locations strive to promote their cultures, languages and identities in a globalizing world (I, CC, GC)

1.3 appreciate how identities and cultures shape, and are shaped by, globalization (I, CC, GC)

▸ Knowledge and Understanding

Students will:

1.4 explore ways in which individuals and collectives express identities (traditions, language, religion, spirituality, the arts, attire, relationship to land, ideological beliefs, role modelling) (I, CC, LPP)

1.5 explore understandings and dimensions of globalization (political, economic, social, other contemporary examples) (PADM, ER, CC)

1.6 examine the impact of communications technology and media on diversity (universalization of pop culture, hybridization, diversification) (I, CC, GC)

1.7 analyze opportunities presented by globalization to identities and cultures (acculturation, accommodation, cultural revitalization, affirmation of identity, integration) (I, CC, GC)

1.8 analyze challenges presented by globalization to identities and cultures (assimilation, marginalization, accommodation, integration, homogenization) (I, CC, GC)

1.9 evaluate efforts to promote languages and cultures in a globalizing world (language laws, linguistic rights, cultural content legislation, cultural revitalization, linguistic revitalization) (I, CC)

C Citizenship				I Identity	
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
CC	Culture and Community	PADM	Power, Authority and Decision Making	TCC	Time, Continuity and Change

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Related Issue 2

To what extent should contemporary society respond to the legacies of historical globalization?

General Outcome

Students will assess the impacts of historical globalization on Indigenous and non-Indigenous peoples.

Specific Outcomes

▸ Values and Attitudes

Students will:

2.1 recognize and appreciate historical and contemporary consequences of European contact, historical globalization and imperialism on Aboriginal societies (TCC, CC, I, GC)

2.2 exhibit a global consciousness with respect to the human condition (GC, C)

2.3 accept social responsibilities associated with global citizenship (C, GC)

2.4 recognize and appreciate the validity of oral histories (TCC, CC)

2.5 recognize and appreciate various perspectives regarding the prevalence and impacts of Eurocentrism (TCC, CC, I)

▸ Knowledge and Understanding

Students will:

2.6 examine impacts of cultural contact between Indigenous and non-Indigenous peoples (exchange of goods and technologies, depopulation, influences on government and social institutions) (TCC, CC, GC)

2.7 explore the foundations of historical globalization (rise of capitalism, industrialization, imperialism, Eurocentrism) (TCC, ER, PADM)

2.8 explore the relationship between historical globalization and imperialism (TCC, ER, LPP, PADM)

2.9 examine multiple perspectives on the political, economic and social impacts of historical globalization and imperialism (I, LPP, PADM)

2.10 examine imperialist policies and practices that affected Indigenous peoples (British rule in India, British and French rule in Canada, post-colonial governments in Canada) (TCC, PADM, GC)

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	C Citizenship			I Identity	
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
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(continued)

2.11 analyze contemporary global issues that have origins in policies and practices of post-colonial governments in Canada and other locations (consequences of residential schools, social impact on Indigenous peoples, loss of Indigenous languages, civil strife) (GC, CC, TCC, I)

2.12 evaluate various attempts to address consequences of imperialist policies and practices on Indigenous peoples in Canada and other locations (GC, PADM, TCC)

2.13 examine legacies of historical globalization and imperialism that continue to influence globalization (TCC, GC)

	C Citizenship		I Identity		
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
CC	Culture and Community	PADM	Power, Authority and Decision Making	TCC	Time, Continuity and Change

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Key Issue: ***To what extent should we embrace globalization?***

Related Issue 3

To what extent does globalization contribute to sustainable prosperity for all people?

General Outcome

Students will assess economic, environmental and other contemporary impacts of globalization.

Specific Outcomes

▸ Values and Attitudes

Students will:

3.1 recognize and appreciate multiple perspectives that exist with respect to the relationships among politics, economics, the environment and globalization (GC, ER, PADM)

3.2 recognize and appreciate impacts of globalization on the interdependent relationships among people, the economy and the environment (GC, ER, PADM)

▸ Knowledge and Understanding

Students will:

3.3 explore understandings of contemporary economic globalization (GC, ER)

3.4 examine the foundations of contemporary globalization (F. A. Hayek, Bretton Woods Conference, Milton Friedman) (TCC, PADM, ER)

3.5 analyze factors contributing to the expansion of globalization since the Second World War (international agreements, international organizations, transnational corporations, media and transportation technologies) (TCC, GC, ER, PADM)

3.6 analyze political and economic challenges and opportunities of globalization (trade liberalization, foreign investment, economic growth, privatization, outsourcing, knowledge economy) (ER, PADM, GC)

3.7 explore multiple perspectives regarding the relationship among people, the land and globalization (spirituality, stewardship, sustainability, resource development) (LPP, CC, ER, GC)

3.8 evaluate actions and policies associated with globalization that impact the environment (land and resource use, resource development agreements, environmental legislation) (LPP, ER, GC)

3.9 analyze multiple perspectives on sustainability and prosperity in a globalizing world (ER, LPP, GC)

	C Citizenship		I Identity		
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
CC	Culture and Community	PADM	Power, Authority and Decision Making	TCC	Time, Continuity and Change

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Related Issue 4

To what extent should I, as a citizen, respond to globalization?

General Outcome

Students will assess their roles and responsibilities in a globalizing world.

Specific Outcomes

▸ Values and Attitudes

Students will:

4.1 recognize and appreciate the impact of globalization on the quality of life of individuals and communities (GC, C, CC)

4.2 recognize and appreciate the importance of human rights in determining quality of life (GC, C)

4.3 accept political, social and environmental responsibilities associated with global citizenship (C, GC, ER)

▸ Knowledge and Understanding

Students will:

4.4 explore various understandings of quality of life (GC)

4.5 analyze impacts of globalization on children and youth (awareness of global issues, employment issues, identity) (GC, C, PADM, ER, I)

4.6 analyze impacts of globalization on women (gender issues, labour issues, opportunities for entrepreneurship) (GC, C, PADM, ER, I)

4.7 evaluate relationships between globalization and democratization and human rights (GC, PADM)

4.8 analyze how globalization affects individuals and communities (migration, technology, agricultural issues, pandemics, resource issues, contemporary issues) (GC, LPP)

(continued on next page)

		C	Citizenship	I	Identity
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
CC	Culture and Community	PADM	Power, Authority and Decision Making	TCC	Time, Continuity and Change

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4.9 explore multiple perspectives regarding the civic responsibilities that individuals, governments, organizations and businesses may have in addressing opportunities and challenges presented by globalization (GC, C, PADM)

4.10 evaluate means by which individuals, governments, organizations and businesses could address opportunities and challenges of globalization (pro-globalization activism, anti-globalization activism, legislation, agreements, consumer activism, corporate responsibility) (GC, C, PADM, ER)

4.11 develop strategies to demonstrate active, responsible global citizenship (C, GC, PADM, ER)

	C Citizenship		I Identity		
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
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SOCIAL STUDIES 10-2: Living in a Globalizing World

Overview

Students will explore historical aspects of globalization as well as the effects of globalization on lands, cultures, human rights and quality of life. Students will explore the relationships among globalization, citizenship and identity. The infusion of multiple perspectives will allow students to examine the effects of globalization on peoples in Canada and other locations, including the impact on Aboriginal and Francophone communities. Students will develop skills to respond to issues emerging in an increasingly globalized world.

Rationale

By examining opportunities and challenges associated with globalization, the process by which the world is becoming increasingly connected and interdependent, students will develop awareness of the impacts of globalization. Recognizing and appreciating the influence of globalization will lead students to examine their roles as responsible and active citizens in a globalizing world.

Key Issue	Key Outcome
To what extent should we embrace globalization?	**Students will understand, assess and respond to the complexities of globalization.**
Related Issues	**General Outcomes**
1. *Should globalization shape identity?*	Students will explore the impacts of globalization on their lives.
2. *Should people in Canada respond to the legacies of historical globalization?*	Students will understand the effects of historical globalization on Indigenous and non-Indigenous peoples.
3. *Does globalization contribute to sustainable prosperity for all people?*	Students will understand economic, environmental and other impacts of globalization.
4. *Should I, as a citizen, respond to globalization?*	Students will examine their roles and responsibilities in a globalizing world.

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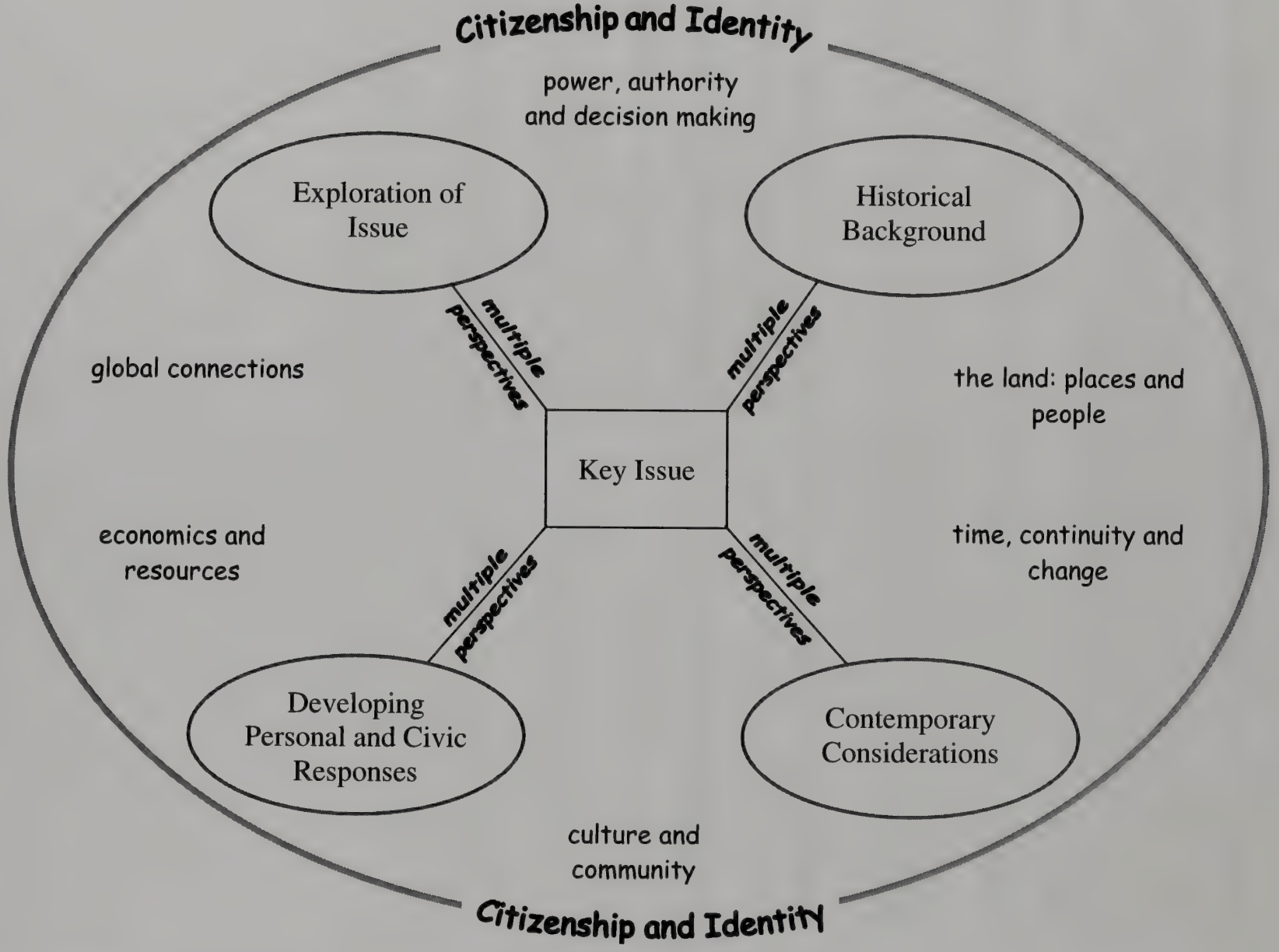
SENIOR HIGH SCHOOL SOCIAL STUDIES COURSE ORGANIZER



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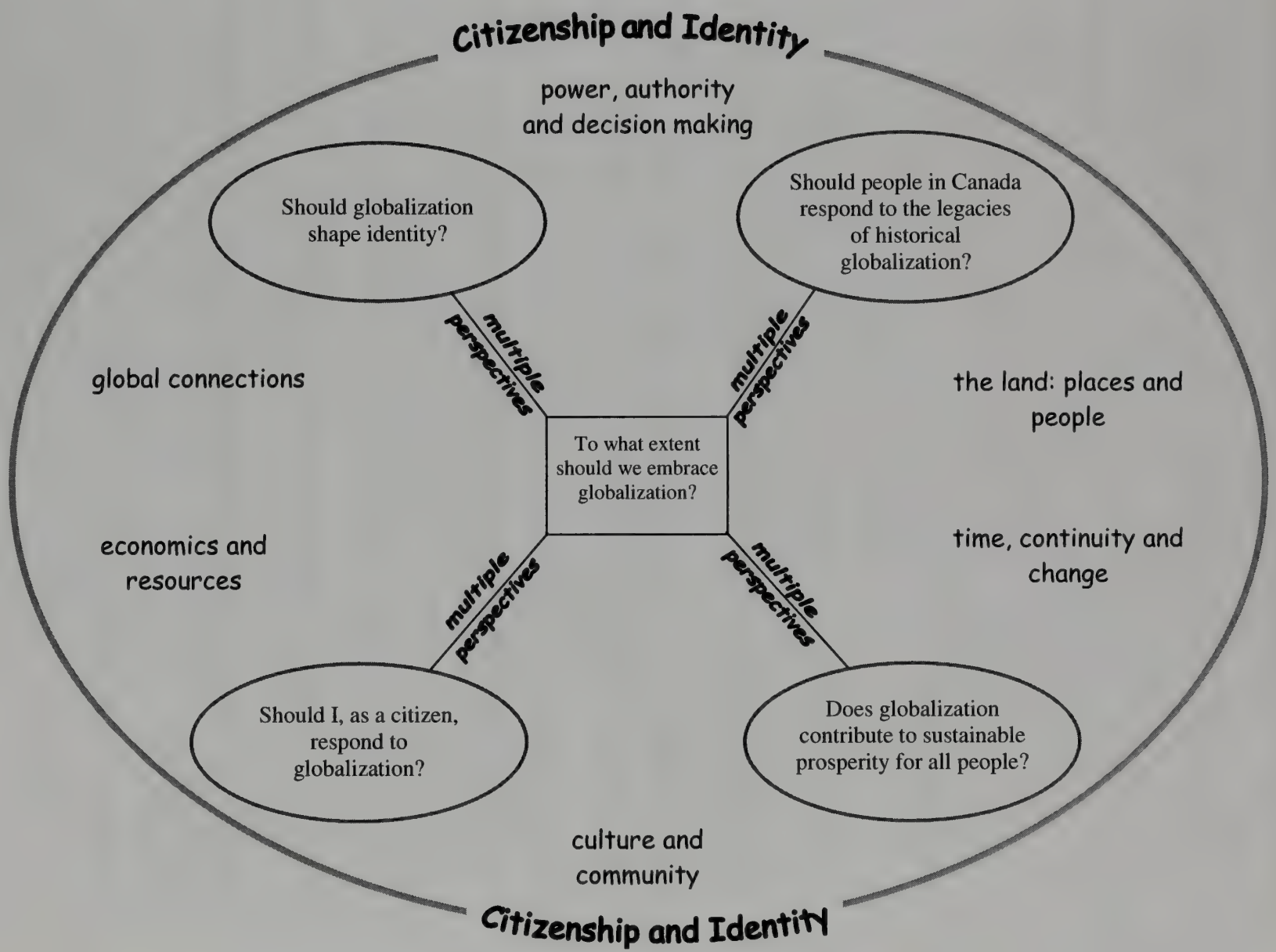
SOCIAL STUDIES 10-2 COURSE ORGANIZER


Citizenship and Identity
power, authority and decision making
Should globalization shape identity?
Should people in Canada respond to the legacies of historical globalization?
multiple perspectives
multiple perspectives
global connections
the land: places and people
To what extent should we embrace globalization?
economics and resources
time, continuity and change
multiple perspectives
multiple perspectives
Should I, as a citizen, respond to globalization?
Does globalization contribute to sustainable prosperity for all people?
culture and community
Citizenship and Identity

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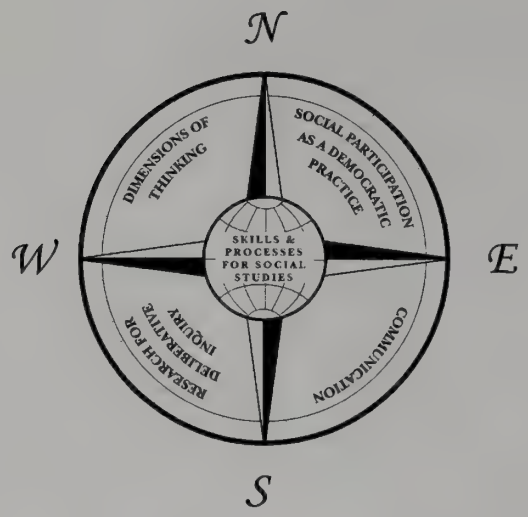

Benchmark Skills and Processes

The following benchmark skills and processes are outcomes to be achieved by the end of Social Studies 30-2.

Dimensions of Thinking	
critical thinking and creative thinking	analyze ideas and information from multiple sources
historical thinking	understand diverse historical and contemporary perspectives within and across cultures
geographic thinking	analyze the ways in which physical and human geographic features influence world events
decision making and problem solving	demonstrate skills needed to reach consensus, solve problems and formulate positions
Social Participation as a Democratic Practice	
cooperation, conflict resolution and consensus building	demonstrate leadership by persuading, compromising and negotiating to resolve conflicts and differences
age-appropriate behaviour for social involvement	demonstrate leadership by engaging in actions that will enhance the well-being of self and others in the community
Research for Deliberative Inquiry	
research and information	develop and express an informed position on an issue
Communication	
oral, written and visual literacy	communicate effectively in a variety of situations
media literacy	assess the authority, reliability and validity of electronically accessed information

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SKILLS AND PROCESSES FOR SOCIAL STUDIES 10-2

The following skills and processes are outcomes to be achieved within the contexts of Social Studies 10-2. Selected Information and Communication Technology (ICT) outcomes are suggested throughout the program and are indicated by this symbol ➢.

DIMENSIONS OF THINKING

Students will:

S.1 develop skills of critical thinking and creative thinking:

- analyze ideas and information from multiple sources
- determine relationships among multiple sources of information
- determine the validity of information based on context, bias, sources, objectivity, evidence or reliability
- suggest likely outcomes based on factual information
- evaluate personal assumptions and opinions
- determine the strengths and weaknesses of arguments
- identify seemingly unrelated ideas to explain a concept or event
- analyze current affairs from a variety of perspectives
- identify main ideas underlying a position or issue

S.2 develop skills of historical thinking:

- understand diverse historical and contemporary perspectives within and across cultures
- analyze connections among patterns of historical change by identifying cause and effect relationships
- compare and contrast historical narratives
- identify and describe the impact of significant historical periods and patterns of change on society today
- understand the difference between historical facts and historical interpretations
- compare alternative historical narratives
- develop reasoned arguments supported by historical and contemporary evidence

➢ describe how changes in technology can benefit or harm society

➢ use current, reliable information sources from around the world

S.3 develop skills of geographic thinking:

- analyze the ways in which physical and human geographic features influence world events
- draw conclusions from maps and other geographic sources
- locate, gather, interpret and organize information, using historical maps
- assess the impact of human activities on the land and the environment

➢ use current, reliable information sources from around the world, including online atlases

S.4 demonstrate skills of decision making and problem solving:

- demonstrate skills needed to reach consensus, solve problems and formulate positions
- use inquiry processes to make decisions and solve problems
- apply ideas and strategies to contribute to decision making and problem solving

➢ describe a plan of action to use technology to solve a problem

➢ use appropriate tools and materials to accomplish a plan of action

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SOCIAL PARTICIPATION AS A DEMOCRATIC PRACTICE

Students will:

S.5 demonstrate skills of cooperation, conflict resolution and consensus building:

- demonstrate leadership by persuading, compromising and negotiating to resolve conflicts and differences
- make meaningful contributions to discussion and group work
- identify behaviours and attitudes that contribute or pose obstacles to cross-cultural understanding
- consider the needs and perspectives of others
- identify and use a variety of strategies to resolve conflicts peacefully and equitably
- demonstrate cooperativeness in groups to solve problems

S.6 develop age-appropriate behaviour for social involvement as responsible citizens contributing to their community:

- demonstrate leadership by engaging in actions that will enhance the well-being of self and others in the community
- promote and respect the contributions of team members when working as a team
- cooperate with others for the well-being of the community

RESEARCH FOR DELIBERATIVE INQUIRY

Students will:

S.7 apply the research process:

- develop and express an informed position on an issue
- develop conclusions based on evidence gathered through research of a wide variety of sources
- use research tools and methods to investigate issues
- consult a wide variety of sources, including oral histories, that reflect varied viewpoints on particular issues
- revise questions on an issue as new information becomes available
- select relevant information when conducting research
- cite sources correctly to respect the ownership and integrity of information
- ➢ use calendars, time management or project management software to assist in organizing the research process
- ➢ plan and perform searches, using digital sources
- ➢ generate understandings of issues by using some form of technology to facilitate the process

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COMMUNICATION

Students will:

S.8 demonstrate skills of oral, written and visual literacy:

- communicate effectively in a variety of situations
- engage in respectful discussion
- use a variety of oral, written and visual sources to present informed positions on issues
- ask respectful and relevant questions of others to clarify viewpoints on an issue
- make respectful and reasoned comments on the topic of discussion
- ➢ use technology to compose, revise and edit text
- ➢ employ technologies to adapt information for context (situation, audience and purpose)

S.9 develop skills of media literacy:

- ➢ assess the authority, reliability and validity of electronically accessed information
- ➢ analyze the validity of various points of view in media messages
- ➢ analyze information from multiple sources, evaluating each source in terms of the author's perspective or bias and use of evidence
- ➢ analyze the impact of various forms of media
- ➢ demonstrate discriminatory selection of electronically accessed information

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Key Issue: ***To what extent should we embrace globalization?***

Related Issue 1

Should globalization shape identity?

General Outcome

Students will explore the impacts of globalization on their lives.

Specific Outcomes

Values and Attitudes

Students will:

1.1 acknowledge and appreciate the existence of multiple perspectives in a globalizing world (GC, CC)

1.2 appreciate why peoples in Canada and other locations strive to promote their cultures, languages and identities in a globalizing world (I, CC, GC)

1.3 appreciate how identities and cultures shape, and are shaped by, globalization (I, CC, GC)

Knowledge and Understanding

Students will:

1.4 identify the various ways that people in Canada express their identities (traditions, language, religion, spirituality, the arts, attire, relationship to land, role modelling) (I, CC, LPP)

1.5 explore understandings and dimensions of globalization (political, economic, social, other contemporary examples) (PADM, ER, CC)

1.6 explore the impact of communications technology and media on diversity (universalization of pop culture, hybridization, diversification) (I, CC, GC)

1.7 examine opportunities presented by globalization to identities and cultures of peoples in Canada (acculturation, accommodation, cultural revitalization, affirmation of identity, integration) (I, CC, GC)

1.8 examine challenges presented by globalization to identities and cultures of peoples in Canada (assimilation, marginalization, accommodation, integration, homogenization) (I, CC, GC)

1.9 analyze the efforts to promote languages and cultures in Canada in response to globalization (language and cultural legislation, revitalization of language and culture) (I, CC)

	C Citizenship			I Identity	
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
CC	Culture and Community	PADM	Power, Authority and Decision Making	TCC	Time, Continuity and Change

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Key Issue: ***To what extent should we embrace globalization?***

Related Issue 2

Should people in Canada respond to the legacies of historical globalization?

General Outcome

Students will understand the effects of historical globalization on Indigenous and non-Indigenous peoples.

Specific Outcomes

Values and Attitudes

Students will:

2.1 recognize and appreciate historical and contemporary consequences of European contact, historical globalization and imperialism on Aboriginal societies (TCC, CC, I, GC)

2.2 exhibit a global consciousness with respect to the human condition (GC, C)

2.3 accept social responsibilities associated with global citizenship (C, GC)

2.4 recognize and appreciate the validity of oral histories (TCC, CC)

2.5 recognize and appreciate various perspectives regarding the prevalence and impacts of Eurocentrism (TCC, CC, I)

Knowledge and Understanding

Students will:

2.6 identify the effects of cultural contact between Europeans and Indigenous peoples in Canada and one other location (exchange of goods and technologies, depopulation, influences on government) (TCC, CC, GC)

2.7 explore the foundations of historical globalization (rise of capitalism, industrialization, imperialism, Eurocentrism) (TCC, ER, PADM)

2.8 explore the relationship between historical globalization and imperialism (TCC, ER, LPP, PADM)

2.9 examine multiple perspectives on the political, economic and social impacts of imperialism in Canada (I, LPP, PADM)

2.10 examine the consequences of imperialism in Canada for Aboriginal Peoples (*Indian Act*, consequences of residential schools, social impact on Indigenous peoples) (CC, TCC, I, GC)

2.11 analyze various attempts to address the consequences of imperialism in Canada (Royal Commission on Aboriginal Peoples, contemporary examples) (TCC, GC, PADM)

2.12 identify legacies of historical globalization and imperialism that continue to influence globalization (TCC, GC)

C	Citizenship			I	Identity
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
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Key Issue: ***To what extent should we embrace globalization?***

Related Issue 3

Does globalization contribute to sustainable prosperity for all people?

General Outcome

Students will understand economic, environmental and other impacts of globalization.

Specific Outcomes

▸ **Values and Attitudes**

Students will:

3.1 recognize and appreciate multiple perspectives that exist with respect to the relationships among economics, politics, the environment and globalization (GC, ER, PADM)

3.2 recognize and appreciate impacts of globalization on the interdependent relationships among the economy, people and the environment (GC, ER, PADM)

▸ **Knowledge and Understanding**

Students will:

3.3 explore various understandings of contemporary economic globalization (GC, ER)

3.4 identify foundations of contemporary globalization (Bretton Woods Conference) (TCC, PADM, ER)

3.5 identify factors contributing to the expansion of globalization since the Second World War (international agreements, international organizations, media and transportation technologies, transnational corporations) (TCC, GC, ER, PADM)

3.6 examine the political and economic challenges and opportunities of globalization (trade liberalization, foreign investment, economic growth, outsourcing, knowledge economy) (ER, PADM, GC)

3.7 explore multiple perspectives on relationships among people, the land and globalization (spirituality, stewardship, sustainability, resource development) (LPP, CC, GC, ER)

3.8 analyze the impact of actions and policies associated with globalization on the environment (land and resource use, resource development agreements, environmental legislation) (LPP, ER, GC)

3.9 examine multiple perspectives on sustainability and prosperity in a globalizing world (ER, LPP, CC)

	C Citizenship			I Identity	
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
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Related Issue 4

Should I, as a citizen, respond to globalization?

General Outcome

Students will examine their roles and responsibilities in a globalizing world.

Specific Outcomes

▸ Values and Attitudes

Students will:

4.1 recognize and appreciate the impact of globalization on the quality of life of individuals and communities (GC, C)

4.2 recognize and appreciate the importance of human rights in determining quality of life (GC, C)

4.3 accept political, social and environmental responsibilities associated with global citizenship (C, GC, ER)

▸ Knowledge and Understanding

Students will:

4.4 explore various understandings of quality of life (GC)

4.5 examine impacts of globalization on children and youth (awareness of global issues, employment issues, identity) (GC, C, PADM, ER)

4.6 examine impacts of globalization on women (gender issues, labour issues, opportunities for entrepreneurship) (GC, C, PADM, ER)

4.7 analyze relationships between globalization and democratization and human rights (GC, PADM)

4.8 examine how globalization affects individuals and communities (migration, technology, agricultural issues, pandemics, resource issues, contemporary issues) (GC, LPP)

4.9 explore multiple perspectives regarding the civic responsibilities that individuals, governments, organizations and businesses in Canada may have in addressing the opportunities and challenges presented by globalization (GC, C, PADM)

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	C Citizenship		I Identity		
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
CC	Culture and Community	PADM	Power, Authority and Decision Making	TCC	Time, Continuity and Change

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(continued)

4.10 analyze means by which individuals, governments, organizations and businesses in Canada could address the opportunities and challenges of globalization (pro-globalization activism, anti-globalization activism, legislation, agreements, consumer activism, corporate responsibility) (GC, C, PADM, ER)

4.11 develop strategies to demonstrate active, responsible global citizenship (C, GC, PADM, ER)

	C Citizenship		I Identity		
ER	Economics and Resources	LPP	The Land: Places and People	GC	Global Connections
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Effective September 2007, pages 9 to 24 have been **removed** and **replaced** with the **new provincially implemented** Social Studies 10-1 Program of Studies.

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Effective September 2007, pages 9 to 24 have been **removed** and **replaced** with the **new provincially implemented** Social Studies 10-2 Program of Studies.

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